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BCS/BAD/BAI/BDS301

Third Semester B.E./B.Tech. Degree Examination, June/July 2026 Mathematics for Computer Science

Time: 3 hrs.

Max. Marks: 100

- Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks, L: Bloom's level, C: Course outcomes.
3. VTU Mathematics Formula Hand Book is permitted.*

Module – 1			M	L	C																
Q.1	a.	Find the value of K such that the following distribution represent a finite probability distribution. Hence find $P(x \leq 1)$, $P(x > 1)$ and $P(-1 < x \leq 2)$. <table><tr><td>x</td><td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>P(x)</td><td>k</td><td>2k</td><td>3k</td><td>4k</td><td>3k</td><td>2k</td><td>k</td></tr></table>	x	-3	-2	-1	0	1	2	3	P(x)	k	2k	3k	4k	3k	2k	k	06	L2	CO1
x	-3	-2	-1	0	1	2	3														
P(x)	k	2k	3k	4k	3k	2k	k														
	b.	Find the mean and variance of Binomial Distribution.	07	L2	CO2																
	c.	The marks of 1000 students in an examination follows a normal distribution with mean 70 and standard deviation 5. Find the number of students whose marks will be (i) less than 65 (ii) more than 75 (iii) between 65 and 75. $[\phi(1) = 0.3413]$.	07	L3	CO2																
OR																					
Q.2	a.	Find the constant k such that $f(x) = \begin{cases} kx^2 & 0 < x < 3 \\ 0 & \text{otherwise} \end{cases}$ is a P.d.f. Also find (i) $P(1 < x < 2)$ (ii) $P(x \leq 1)$ (iii) $P(x > 1)$	06	L2	CO1																
	b.	The probability that a pen manufactured by a factory be defective is 1/10. If 12 such pens are manufactured what is the probability that (i) exactly 2 defective. (ii) atleast 2 are defective (iii) none of them are defective.	07	L3	CO2																
	c.	If the probability of a bad reaction from a certain injection is 0.001. Determine the chance that out of 2000 individuals, more than two will get a bad reaction.	07	L3	CO2																
Module – 2																					
Q.3	a.	The joint probability distribution of two random variables X and Y is <table><tr><td>X/Y</td><td>- 4</td><td>2</td><td>7</td></tr><tr><td>1</td><td>1/8</td><td>1/4</td><td>1/8</td></tr><tr><td>5</td><td>1/4</td><td>1/8</td><td>1/8</td></tr></table> Find the marginal distribution and covariance of X and Y.	X/Y	- 4	2	7	1	1/8	1/4	1/8	5	1/4	1/8	1/8	06	L2	CO2				
X/Y	- 4	2	7																		
1	1/8	1/4	1/8																		
5	1/4	1/8	1/8																		
	b.	Find the unique probability vector for the regular stochastic matrix $\begin{bmatrix} 0 & 3/4 & 1/4 \\ 1/2 & 1/2 & 0 \\ 0 & 1 & 0 \end{bmatrix}$	07	L2	CO3																

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	c.	Three boys A, B, C are throwing ball to each other. A always throws the ball to B and B always throws the ball to C. C is just or likely to throw the ball to B or to A. If C was the first person to throw the ball find the probabilities that after three throws, A has the ball.	07	L3	CO3
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OR

Q.4	a.	The joint probability distribution table for 2 random variables X and Y as follows: <table><tr><td>x \ y</td><td>-2</td><td>-1</td><td>4</td><td>5</td></tr><tr><td>1</td><td>0.1</td><td>0.2</td><td>0</td><td>0.3</td></tr><tr><td>2</td><td>0.2</td><td>0.1</td><td>0.1</td><td>0</td></tr></table> Find covariance of X and Y.	x \ y	-2	-1	4	5	1	0.1	0.2	0	0.3	2	0.2	0.1	0.1	0	06	L2	CO2
x \ y	-2	-1	4	5																
1	0.1	0.2	0	0.3																
2	0.2	0.1	0.1	0																
	b.	Find the unique fixed probability vector for the regular stochastic matrix $A = \begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$	07	L2	CO3															
	c.	A gambler's luck follows a pattern. If he wins a game, the probability of winning the next game is 0.6. However if he losses a game, the probability of losing the next game is 0.7. There is an even chance of gambler winning the first game. i) What is the probability of he winning the second game? ii) In the long run, how often he will win?	07	L3	CO3															

Module – 3

Q.5	a.	Define Null Hypothesis, Type I and Type II Error in a statistical test.	06	L1	CO4
	b.	A coin was tossed 400 time and head turned up 216 times. Test the hypothesis that the coin is unbiased at 5% level of significance.	07	L3	CO4
	c.	A survey was conducted in a slum locality of 2000 families by selecting a sample of size 800. It was revealed that 180 families were illiterates. Find the probable limit of the illiterate families in the population of 2000 at 10% level of significance.	07	L3	CO5

OR

Q.6	a.	A coin is tossed 1000 times and head turns up 540 times. Decide on the hypothesis that the coin is unbiased at 10% level of significance.	06	L2	CO4
	b.	In a sample of 500 men, its was found that 60% of them had over weight. What can we infer about the proportion of people having over weight in the population (For $Z_{0.1} = 2.58$)	07	L2	CO4
	c.	One type of aircraft is found to develop engine trouble in 5 flights out of a total of 100 and another type in 7 flights out of a total of 200 flights. Is there a significance difference in the two types of aircrafts so far as engine defects are concerned at 5% LOS?	07	L3	CO4

Module – 4

Q.7	a.	Use the theorem to evaluate $P[50 < \bar{x} < 56]$ where $\bar{x}$ represents the mean of a random sample of size 100 from an infinite population with mean $\mu = 53$ and variance $\sigma^2 = 400$ [$\phi(1.5) = 0.4332$]	06	L2	CO5														
	b.	Ten individuals are chosen at random from a population and their height inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. Test the hypothesis that mean height of the universe is 66 inches. [$t_{0.05} = 2.262$ for 9 df].	07	L2	CO4														
	c.	A die is thrown 264 times and the number appearing on the face (x) follows the following frequency distribution. <table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>y</td><td>40</td><td>30</td><td>26</td><td>56</td><td>52</td><td>60</td></tr></table> Calculate the value of χ^2 at 5% of LOS.	x	1	2	3	4	5	6	y	40	30	26	56	52	60	07	L3	CO4
x	1	2	3	4	5	6													
y	40	30	26	56	52	60													

OR

Q.8	a.	The two independent samples of 8 and 7 items respectively had the following values of the variables: Sample 1 : 9 11 13 11 15 9 12 14 Sample 2 : 10 12 10 14 9 8 10 Do the two estimates of population variance differ significantly at 5% LOS? (F at 5% ($V_1 = 7$; $V_2 = 6$) = 4.21).	06	L2	CO4														
	b.	The nine items of a sample have the following values 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these differ significantly from the assumed mean of 47.5 at 5% significance level?	07	L3	CO4														
	c.	The number of accidents per day (x) as recorded in a textile industry over a period of 400 days is given below. Test the goodness of fit in the respect of Poisson distribution of fit to the given data $\{\chi^2_{0.05} = 9.49$ for 4 df $\}$. <table border="1"><tr><td>x :</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>y :</td><td>173</td><td>168</td><td>37</td><td>18</td><td>3</td><td>1</td></tr></table>	x :	0	1	2	3	4	5	y :	173	168	37	18	3	1	07	L3	CO4
x :	0	1	2	3	4	5													
y :	173	168	37	18	3	1													

Module – 5

Q.9	a.	Three type of fertilizer are used on three groups of plants for 6 weeks. We want to check if there is a difference in the mean growth of each group, using the data given below. Apply a one way ANOVA test at 0.05 significant level.	10	L3	CO6																					
		<table><tr><td>Fertilizer 1</td><td>6</td><td>8</td><td>4</td><td>5</td><td>3</td><td>4</td></tr><tr><td>Fertilizer 2</td><td>8</td><td>12</td><td>9</td><td>11</td><td>6</td><td>8</td></tr><tr><td>Fertilizer 3</td><td>13</td><td>9</td><td>11</td><td>8</td><td>7</td><td>12</td></tr></table>	Fertilizer 1	6	8	4	5	3	4	Fertilizer 2	8	12	9	11	6	8	Fertilizer 3	13	9	11	8	7	12			
Fertilizer 1	6	8	4	5	3	4																				
Fertilizer 2	8	12	9	11	6	8																				
Fertilizer 3	13	9	11	8	7	12																				

- b.** Analyze and interpret the following statistics concerning output of wheat for field obtained as result of experiment conducted to test for four varieties of wheat viz, A, B, C and D under Latin Square design.

C	B	A	D
25	23	20	20
A	D	C	B
19	19	21	18
B	A	D	C
19	14	17	20
D	C	B	A
17	20	21	15

10 L3 CO6

OR

- Q.10 a.** Three different kinds of food are tested on three groups of rats for 6 weeks. The objective is to check the difference in mean weight (in grams) of the rats per week. Apply one-way ANOVA using a 0.05 significance level to the following data :

Food 1	8	12	19	8	6	11
Food 2	4	5	4	6	9	7
Food 3	11	8	7	13	7	9

10 L3 CO6

- b.** Present your conclusions after doing analysis of variance to the following results of the Latin – square design experiment conducted in respect of five fertilizers which were used on plots of different fertility.

A	B	C	D	E
16	10	11	9	9
E	C	A	B	D
10	9	14	12	11
B	D	E	C	A
15	8	8	10	18
D	E	B	A	C
12	6	13	13	12
C	A	D	E	B
13	11	10	7	14

10 L3 CO6

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BCS302

Third Semester B.E./B.Tech. Degree Examination, June/July 2026

Digital Design and Computer Organization

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Simplify the following Boolean functions using K-map and obtain the simplified Boolean expressions. i) $F_1(A, B, C, D) = \sum m(1, 3, 4, 5, 7, 10, 12)$ ii) $F_2(A, B, C, D) = \sum m(5, 8, 9, 10, 11, 12, 13, 14, 15)$	7	L3	CO1
	b.	Simplify the following Boolean expressions using 4-variable maps : $F = \overline{A}BC\overline{D} + B\overline{C}D + A\overline{C}D + \overline{A}BCD + A\overline{C}\overline{D}$	8	L3	CO1
	c.	List out the properties of Boolean algebra.	5	L1	CO1
OR					
Q.2	a.	Minimize the following function for POS using K-map and realize it by using basic gates. $F = \pi M(0, 1, 2, 6, 11, 12).d(3, 4, 7, 15)$	7	L3	CO1
	b.	Implement the Boolean function : $F(x, y, z) = \sum m(0, 1, 3, 5, 6, 7)$ with NAND gates.	8	L3	CO1
	c.	Explain the digital logic gates.	5	L1	CO1
Module – 2					
Q.3	a.	Design verilog HDL to implement AND gate, using structural data flow and behavioral model.	7	L2	CO2
	b.	Design a BCD to an excess – 3 code converter and draw the logic diagram of the implementation.	8	L2	CO2
	c.	Explain the steps involved in design procedure of a combinational circuit with an example.	5	L1	CO2
OR					
Q.4	a.	Write VHDL code for 4-bit parallel adder.	7	L2	CO2
	b.	What is Multiplexer? Explain the 8 : 1 multiplexer with the help of logic diagram and corresponding expression.	8	L2	CO2
	c.	What is Latch? Explain the working of SR latch.	5	L2	CO2

Module – 3					
Q.5	a.	Explain with a neat diagram the connection between the processor and the memory.	10	L2	CO3
	b.	What is Performance Measurement? Explain the overall SPEC rating for the computer in a program suite.	10	L2	CO3
OR					
Q.6	a.	With a neat diagram, analyze the operational concepts of a computer. Give the operating steps.	10	L2	CO3
	b.	With a neat diagram, explain the single bus architecture and IO interface for an input device.	10	L2	CO3
Module – 4					
Q.7	a.	What is the DMA Bus Arbitration? Explain the different Bus Arbitration Techniques.	10	L2	CO3
	b.	Explain the following : i) Direct mapping ii) Associative mapping iii) Set Associative mapping functions.	10	L2	CO4
OR					
Q.8	a.	Explain the Memory Hierarchy. Describe the effect of size, cost and speed.	10	L2	CO4
	b.	Differentiate Interrupts and Exceptions. Explain the polling and daisy chain mechanisms in interrupt handling.	10	L2	CO4
Module – 5					
Q.9	a.	What is Pipelining? With an example, explain the 4-stage pipelining concept.	10	L2	CO5
	b.	Write and explain the control sequence for the execution of the unconditional branch instruction.	10	L3	CO5
OR					
Q.10	a.	Explain the internal organization of the processor.	10	L3	CO5
	b.	Write and explain the control sequence for the execution of the instruction: ADD (R3), R1.	10	L3	CO5

Third Semester B.E./B.Tech. Degree Examination, June/July 2026

Operating Systems

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M : Marks , L: Bloom's level , C: Course outcomes.

3. Draw suitable diagram wherever applicable and assume missing data.

Module – 1			M	L	C																				
Q.1	a.	Define Operating System. Explain briefly multiprogramming and time sharing system.	07	L2	CO1																				
	b.	Differentiate between client server computing and peer to peer computing.	07	L2	CO1																				
	c.	Write code snippet to implement process system call <code>execu()</code> .	06	L3	CO1																				
OR																									
Q.2	a.	Explain the layered approach of operating system structure with a supporting diagram.	07	L2	CO1																				
	b.	Explain abstract view of components of computer system with a neat diagram.	07	L2	CO1																				
	c.	Develop a program to implement process system call <code>fork()</code> and display its own process id and its child id.	06	L3	CO1																				
Module – 2																									
Q.3	a.	Draw the Gantt chart and calculate average waiting time and turn around time for the following snapshot of the processes using (i) FCFS (ii) SRTF (iii) RR. ($q = 2$ ms)	07	L3	CO2																				
		<table><tr><td>Processes</td><td>Burst Time ms</td><td>Arrival Time ms</td></tr><tr><td>P₁</td><td>6</td><td>0</td></tr><tr><td>P₂</td><td>3</td><td>1</td></tr><tr><td>P₃</td><td>1</td><td>2</td></tr><tr><td>P₄</td><td>4</td><td>3</td></tr></table>				Processes	Burst Time ms	Arrival Time ms	P ₁	6	0	P ₂	3	1	P ₃	1	2	P ₄	4	3					
		Processes				Burst Time ms	Arrival Time ms																		
		P ₁				6	0																		
		P ₂				3	1																		
	P ₃	1	2																						
P ₄	4	3																							
b.	What is IPC? Explain direct and indirect communication with respect to message passing.	07	L2	CO2																					
c.	What is Multithreaded Process? Explain the four benefits of multithreaded programming.	06	L2	CO2																					
OR																									
Q.4	a.	Calculate the average waiting time and average turn around time by drawing the Gantt chart using FCFS, SJF – Non Preemptive and Priority algorithm.	07	L2	CO1																				
		<table><tr><td>Processes</td><td>Arrival Time</td><td>Burst Time</td><td>Priority</td></tr><tr><td>P₁</td><td>0</td><td>9</td><td>3</td></tr><tr><td>P₂</td><td>1</td><td>4</td><td>2</td></tr><tr><td>P₃</td><td>2</td><td>9</td><td>1</td></tr><tr><td>P₄</td><td>3</td><td>5</td><td>4</td></tr></table>				Processes	Arrival Time	Burst Time	Priority	P ₁	0	9	3	P ₂	1	4	2	P ₃	2	9	1	P ₄	3	5	4
		Processes				Arrival Time	Burst Time	Priority																	
		P ₁				0	9	3																	
		P ₂				1	4	2																	
	P ₃	2	9	1																					
P ₄	3	5	4																						
Lower Number is highest priority.																									
b.	What is Process? With a neat diagram explain the states of a process with a transition diagram and process control block.	07	L2	CO2																					
c.	Explain scheduler in process execution.	06	L2	CO2																					
Module – 3																									
Q.5	a.	Show how semaphores provide solution to reader writers problem.	06	L2	CO3																				

1 of 2

Q.5	b.	Consider following snapshot of the system. <table><tr><td></td><td colspan="4">Allocation</td><td></td><td colspan="4">Max</td><td></td><td colspan="4">Available</td></tr><tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td></td><td>A</td><td>B</td><td>C</td><td>D</td></tr><tr><td>P₀</td><td>2</td><td>0</td><td>0</td><td>1</td><td></td><td>4</td><td>2</td><td>1</td><td>2</td><td></td><td>3</td><td>3</td><td>2</td><td>1</td></tr><tr><td>P₁</td><td>3</td><td>1</td><td>2</td><td>1</td><td></td><td>5</td><td>2</td><td>5</td><td>2</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>P₂</td><td>2</td><td>1</td><td>0</td><td>3</td><td></td><td>2</td><td>3</td><td>1</td><td>6</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>P₃</td><td>1</td><td>3</td><td>1</td><td>2</td><td></td><td>1</td><td>4</td><td>2</td><td>4</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>P₄</td><td>1</td><td>4</td><td>3</td><td>2</td><td></td><td>3</td><td>6</td><td>6</td><td>5</td><td></td><td></td><td></td><td></td><td></td></tr></table> Answer is the system in safe state. Give the safe sequence using Banker's Algorithm.		Allocation					Max					Available					A	B	C	D		A	B	C	D		A	B	C	D	P ₀	2	0	0	1		4	2	1	2		3	3	2	1	P ₁	3	1	2	1		5	2	5	2						P ₂	2	1	0	3		2	3	1	6						P ₃	1	3	1	2		1	4	2	4						P ₄	1	4	3	2		3	6	6	5						08	L3	CO3
	Allocation					Max					Available																																																																																																			
	A	B	C	D		A	B	C	D		A	B	C	D																																																																																																
P ₀	2	0	0	1		4	2	1	2		3	3	2	1																																																																																																
P ₁	3	1	2	1		5	2	5	2																																																																																																					
P ₂	2	1	0	3		2	3	1	6																																																																																																					
P ₃	1	3	1	2		1	4	2	4																																																																																																					
P ₄	1	4	3	2		3	6	6	5																																																																																																					
	c.	Explain resource allocation graph (i) with Deadlock (ii) with a cycle but no deadlock.	06	L2	CO3																																																																																																									
OR																																																																																																														
Q.6	a.	Illustrate Peterson solution for critical section problem.	05	L2	CO3																																																																																																									
	b.	Using Banker's Algorithm determine whether following system is in safe state. <table><tr><td></td><td colspan="3">Allocation</td><td></td><td colspan="3">Max</td><td></td><td colspan="3">Available</td></tr><tr><td></td><td>A</td><td>B</td><td>C</td><td></td><td>A</td><td>B</td><td>C</td><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>P₀</td><td>0</td><td>0</td><td>2</td><td></td><td>0</td><td>0</td><td>4</td><td></td><td>1</td><td>0</td><td>2</td></tr><tr><td>P₁</td><td>1</td><td>0</td><td>0</td><td></td><td>2</td><td>0</td><td>1</td><td></td><td></td><td></td><td></td></tr><tr><td>P₂</td><td>1</td><td>3</td><td>5</td><td></td><td>1</td><td>3</td><td>7</td><td></td><td></td><td></td><td></td></tr><tr><td>P₃</td><td>6</td><td>3</td><td>2</td><td></td><td>8</td><td>4</td><td>2</td><td></td><td></td><td></td><td></td></tr><tr><td>P₄</td><td>1</td><td>4</td><td>3</td><td></td><td>1</td><td>5</td><td>7</td><td></td><td></td><td></td><td></td></tr></table> If the request from process P₂ arrives for (002) can the request be granted immediately?		Allocation				Max				Available				A	B	C		A	B	C		A	B	C	P ₀	0	0	2		0	0	4		1	0	2	P ₁	1	0	0		2	0	1					P ₂	1	3	5		1	3	7					P ₃	6	3	2		8	4	2					P ₄	1	4	3		1	5	7					08	L3	CO3																					
	Allocation				Max				Available																																																																																																					
	A	B	C		A	B	C		A	B	C																																																																																																			
P ₀	0	0	2		0	0	4		1	0	2																																																																																																			
P ₁	1	0	0		2	0	1																																																																																																							
P ₂	1	3	5		1	3	7																																																																																																							
P ₃	6	3	2		8	4	2																																																																																																							
P ₄	1	4	3		1	5	7																																																																																																							
	c.	What is Critical Section? What are the requirements for solution to critical section problem?	07	L2	CO3																																																																																																									
Module – 4																																																																																																														
Q.7	a.	Consider the following page reference string: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 Assuming there are three memory frames. Determine the page faults occur in case of FIFO, Optimal and LRU replacement algorithm.	08	L3	CO4																																																																																																									
	b.	What is Paging? Explain with neat diagram paging hardware with TLB.	08	L2	CO4																																																																																																									
	c.	Explain Fragmentation in detail.	04	L2	CO4																																																																																																									
OR																																																																																																														
Q.8	a.	Discuss the structure of page table with a suitable diagram.	10	L2	CO4																																																																																																									
	b.	Illustrate how demand paging affects system performances.	06	L2	CO4																																																																																																									
	c.	With the help of neat diagram, explain various steps of address binding.	04	L2	CO4																																																																																																									
Module – 5																																																																																																														
Q.9	a.	Suppose that a disk has 200 cylinders numbered from 0 to 199. The drive is currently serving a request at cylinder 100 and previous request was at cylinder 125. The request of pending request in FIFO order is 27, 129, 110, 186, 147, 41, 10, 64 and 120 What is total distance that the disk arm moves to satisfy all pending request for each of the following algorithm: FCFS, SSTF, SCAN and CLOOK Algorithm.	08	L3	CO5																																																																																																									
	b.	Explain the various access methods of files.	06	L2	CO5																																																																																																									
	c.	Explain the access matrix method of system protection, with the domain as object and its implementation.	06	L2	CO6																																																																																																									
OR																																																																																																														
Q.10	a.	Explain the single level and two level directory with suitable diagram.	08	L2	CO5																																																																																																									
	b.	Explain the different file operations implemented in file system.	06	L2	CO5																																																																																																									
	c.	Explain goals and principles of protection used to protect modern computer system.	06	L2	CO6																																																																																																									

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Third Semester B.E./B.Tech. Degree Examination, June / July 2026

Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Define Data Structures. With a neat diagram explain the classification of data structure with example.	05	L2	CO1
	b.	Write a drawback of static memory allocation. Explain in detail the different functions of dynamic memory allocation.	08	L2	CO1
	c.	Write a program in C to implement push, pop and display operations for stack using array.	07	L3	CO1
OR					
Q.2	a.	What is sparse matrix? Represent the following sparse matrix in both array and triplet form. Also state any 2 applications of sparse matrix. $A = \begin{bmatrix} 10 & 0 & 0 & 25 & 0 \\ 0 & 23 & 0 & 0 & 45 \\ 0 & 0 & 0 & 0 & 32 \\ 42 & 0 & 0 & 31 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 30 & 0 & 0 \end{bmatrix}$	08	L3	CO1
	b.	What is Self – Referential Structure? Bring out the difference between structures and unions.	06	L2	CO1
	c.	i) Write an algorithm to convert infix expression to postfix expression. ii) Convert the following infix expression to post fix expression : ((A + (B – C) * D) E + F	06	L3	CO1
Module – 2					
Q.3	a.	Give the structure definition for singly linked list. Write a C function to : i) Insert an element at end. ii) Delete a node at the beginning.	08	L3	CO2
	b.	Discuss how to implement stacks using linked list with examples.	08	L2	CO2
	c.	Define Queue. Discuss how to represent queues using dynamic arrays.	04	L2	CO2
OR					
Q.4	a.	Write a recursive program to find out GCD of two numbers.	05	L3	CO2
	b.	What are the disadvantages of ordinary queue? Discuss the implementation of circular queue using array.	07	L2	CO2
	c.	Write a C – function to add polynomials. Show the linked list representation of below two polynomials. $p(x) = 3x^{14} + 2x^8 + 1$ $q(x) = 8x^8 - 3x^{10} + 10x^6$	08	L3	CO2

1 of 3

Module – 3

Q.5	a.	Write C function for the following. i) Inserting a node at the beginning of Doubly linked list. ii) Deleting node at the end of the Doubly linked list.	08	L3	CO3
	b.	List the rules to construct the threads. Write the routines for in – order traversal of a threaded binary tree.	06	L3	CO3
	c.	Explain Threaded Binary Tree in detail.	06	L2	CO3

OR

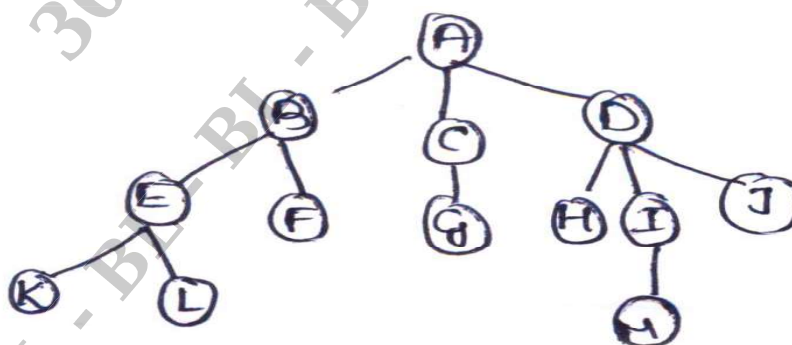
Q.6	a.	Write a function to perform the following using circular doubly linked list with header node. i) insert front → insert element at front end ii) delete rear → delete element from rear end.	10	L3	CO3
	b.	Define Binary Tree. Construct a Binary Tree for the following expression. $((6 + (3 - 2) * 5) 2 + 3)$.	10	L2	CO3

Module – 4

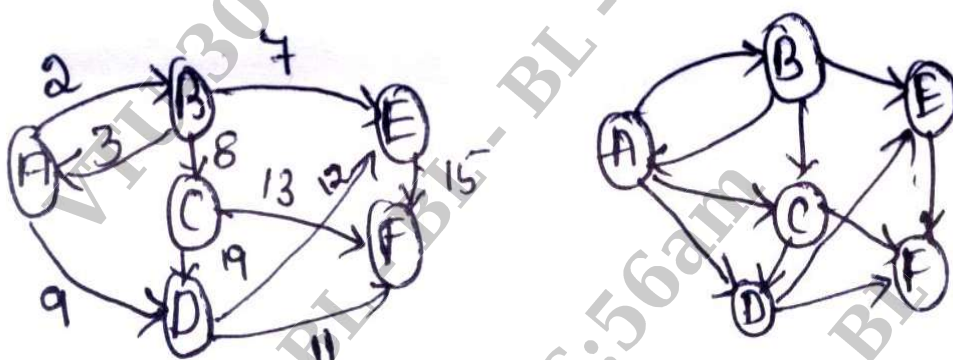
Q.7	a.	Construct the binary tree from the given traversal : Construct a binary tree having sequences : Preorder : ABDGCEHIF In order : DGBAHEICF	10	L3	CO4
	b.	Write a C function to evaluate an expression using expression tree.	10	L3	CO4

OR

Q.8	a.	Write an algorithm to construct binary tree for finding and checking for duplicate data. Trace the algorithm for the input: 14, 15, 4, 9, 7, 18, 3, 5, 16, 4, 20, 17, 9, 14, 5. Indicate a message for duplicate members.	07	L3	CO4
	b.	Draw a binary tree for the following expression $4 + 5 * (6 + 5) / 2 - 4 * (8 + 9 - 3)$. Traverse the above generated tree using in order, pre order and post order.	07	L2	CO4
	c.	Define Tree. For the given tree, explain terminologies and write the answer. i) Degree ii) Non terminal iii) Sibling iv) Ancestor v) Level vi) Height	07	L2	CO4



Module – 5

Q.9	a. What is Priority Queues? Demonstrate functions in C to implement the Max Priority queues with an example. i) Insert into the Max Priority queues ii) Delete into the Max Priority queues iii) Display Max Priority queues.	10	L3	CO5
	b. Explain Hashing and Collision. What are the methods to resolve collisions?	10	L2	CO5
OR				
Q.10	a. What is Graph? Give matrix and adjacency list representation of graph. Show adjacency matrix and list for below graph. 	10	L2	CO1
	b. Consider the following 4 – digit employee 9614, 5882, 6713, 4409, and 1825. Find 2 – digit hash address of each number using i) Division method with 97 ii) Mid_square method iii) The folding without reversing iv) The folding with reversing.	10	L3	CO5

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Thrid Semester B.E./B.Tech. Degree Examination, June/July 2026
Object Oriented Programming with Java

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Explain Object Oriented Principles.	6	L2	CO1
	b.	What are Identifiers? Explain the rules to be followed while using identifiers.	6	L2	CO1
	c.	Develop a Java program to add two matrices of suitable order N (The value of N should be read from command line arguments).	8	L3	CO1
OR					
Q.2	a.	Explain the following Logical operators with example. i) & ii) ^ iii) <	6	L2	CO1
	b.	Define Type Conversion. Explain 2 types of conversion.	6	L2	CO1
	c.	Show the working of traditional for loop and enhanced for loop in Java.	8	L2	CO1
Module – 2					
Q.3	a.	Explain method overloading with an example.	6	L2	CO2
	b.	Explain use of “this” in Java.	6	L2	CO2
	c.	A class called Employee, with models an employee with an ID, name and salary. The method raisesalary (percent) increase the salary by the given percentage. Develop the Employee class and suitable main method for demonstration.	8	L4	CO2
OR					
Q.4	a.	Explain pass by object in Java with example.	6	L2	CO2
	b.	What are Constructor? Explain two types of constructor with example.	6	L2	CO2
	c.	Develop a Java Program to find factorial of a given number using recursion.	8	L3	CO2
Module – 3					
Q.5	a.	What is Multilevel Inheritance? Develop a Java program that demonstrates multilevel inheritance.	10	L3	CO3
	b.	What is an Interface? Develop a Java program that define and implement interface.	10	L3	CO3

OR					
Q.6	a.	Develop a Java Program that demonstrates dynamic method dispatch.	10	L3	CO3
	b.	Explain how super keyword can be used to access super class variable and super class methods with an example program.	10	L2	CO3
Module – 4					
Q.7	a.	What is a Package? Explain with example.	6	L2	CO4
	b.	What is an Exception? Give an example how to handle exception.	6	L2	CO4
	c.	Explain different access modifiers in Java.	8	L2	CO4
OR					
Q.8	a.	Develop a Java Program to raise a custom exception (user defined exception) for DivideByZero using try, catch, throw and finally.	10	L3	CO4
	b.	Develop a Java program to create a package named mypack, import and implement it in a suitable class.	10	L3	CO4
Module – 5					
Q.9	a.	What are Enumerations? Develop a Java program that demonstrate value() and valueOf() methods.	10	L3	CO5
	b.	Define auto-boxing and auto un-boxing and how it is different from boxing and unboxing. Illustrate with an example.	10	L2	CO5
OR					
Q.10	a.	Explain isAlive() and join() with an example.	6	L2	CO5
	b.	Define Synchronization. Explain with an example.	6	L2	CO5
	c.	Define Thread. Develop a java program to create thread in java.	8	L3	CO5

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BCS306B

Third Semester B.E./B.Tech. Degree Examination, June/July 2026 Object Oriented Programming with C++

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Explain the general structure of a C++ program, with an example code.	7	L2	CO1
	b.	Develop a C++ program to swap two numbers using function, choose appropriate parameter passing techniques.	7	L3	CO1
	c.	Mention and explain the parameter passing techniques in C++.	6	L2	CO1
OR					
Q.2	a.	Develop a C++ program using class construct, to accept and display values of a student object, made up of the name, usn and marks of two subjects.	7	L3	CO1
	b.	Explain how dynamic memory can be allocated and deallocated in C++, with suitable code snippet.	7	L2	CO1
	c.	Explain the salient features of object oriented programming.	6	L2	CO1
Module – 2					
Q.3	a.	Explain the implicit pointer “this”. Mention its uses with suitable code snippet.	7	L2	CO2
	b.	Write a note on pointer to objects.	7	L2	CO2
	c.	Develop a C++ program to find the largest of ‘n’ natural numbers.	6	L3	CO2
OR					
Q.4	a.	Mention and explain two constructors supported in C++.	7	L2	CO2
	b.	Define the following : i) Function overloading ii) Default arguments	7	L2	CO2
	c.	Develop a C++ program to find the largest of ‘n’ strings that are accepted and stored in an array.	6	L3	CO2
1 of 2					

Module – 3

Q.5	a.	Explain with syntax in how many ways operators are overloaded in C++.	7	L2	CO3
	b.	Develop a C++ program to overload operator + for class complex. Class complex is made up of real and imaginary values. Overloading + must increment real value by 1. Add accept() and display() functions to the class.	7	L3	CO3
	c.	Explain how post and pre increment operators are overloaded in C++.	6	L2	CO3

OR

Q.6	a.	Illustrate the use of access specifiers in inheritance, with suitable example.	7	L2	CO3
	b.	Develop a C++ program to depict multiple base class inheritance.	7	L3	CO3
	c.	Explain how constructors and destructors are executed in inheritance hierarchy.	6	L2	CO3

Module – 4

Q.7	a.	Explain how polymorphism can be implemented in C++.	7	L2	CO4
	b.	Explain virtual function usage and its significance in C++, with suitable concepts.	7	L2	CO4
	c.	Differentiate between Pure virtual function and Virtual function.	6	L2	CO4

OR

Q.8	a.	Explain with syntax how a generic function can be created in C++ with suitable code snippet.	7	L2	CO4
	b.	Explain with suitable example how a generic function can be explicitly overloaded.	7	L2	CO4
	c.	Explain with suitable example how a function template can be overloaded.	6	L2	CO4

Module – 5

Q.9	a.	Explain with syntax and example how exceptions can be handled in C++.	7	L2	CO5
	b.	Explain with suitable code how a class type exception can be caught and remedy can be provided for the same.	7	L3	CO5
	c.	Mention and explain different types of standard exceptions in C++.	6	L2	CO5

OR

Q.10	a.	Mention and explain bitmask enumeration fnt flags in C++.	7	L2	CO5
	b.	Mention the prototypes of self() and unsetf() methods in C++, explain how it can be used for setting and clearing the flags.	7	L2	CO5
	c.	Explain with suitable code snippets how a file can be opened in ifstream, ofstream and fstream classes of C++.	6	L2	CO5

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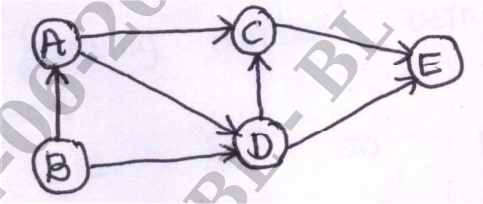
Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026

Analysis & Design of Algorithm

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1				M	L	C
Q.1	a.	Define an Algorithm. With the help of a flowchart, explain the various steps in the algorithm design and analysis process.	8	L1	CO1	
	b.	Explain Asymptotic notations Big O, Big Ω and Big θ that are used to compare the order of growth of algorithm with example.	8	L2	CO1	
	c.	Discuss Brute Force string matching algorithm with example.	4	L2	CO1	
OR						
Q.2	a.	Write an algorithm to search a key using sequential search. Derive its time efficiency for best case, worst case and average case.	8	L2	CO1	
	b.	Explain the general plan for analyzing time efficiency of recursive algorithm. Illustrate mathematical analysis of recursive algorithm for tower of Hanoi.	8	L2	CO1	
	c.	Write selection sort algorithm with time complexity.	4	L2	CO1	
Module – 2						
Q.3	a.	What is topological sorting? Apply DFS and source removal method for below graph to solve topological sorting. 	8	L3	CO2	
	b.	Explain merge sort algorithm with example and discuss its best-case, average-case and worst case efficiency.	8	L2	CO2	
	c.	Explain Exhaustive search technique for travelling salesman problem.	4	L2	CO2	

OR

Q.4	a.	Write an algorithm to sort 'n' numbers using Quick Sort. Trace the algorithm to sort the following list in ascending order 80, 60, 70, 40, 10, 30, 50, 20.	8	L3	CO2
	b.	Illustrate Strassen's matrix multiplication and derive its time complexity.	8	L2	CO2
	c.	Write an algorithm for insertion sort.	4	L1	CO2

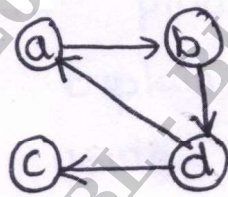
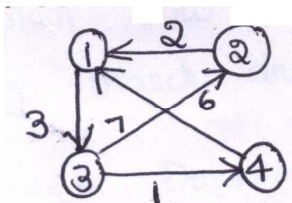
Module – 3

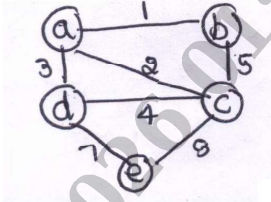
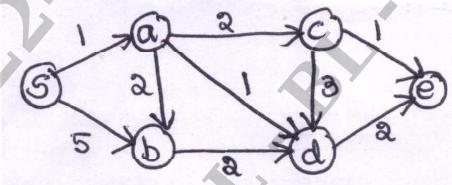
Q.5	a.	Write an algorithm for Heap Sort. Sort the below given lists by heapsort using the array representation of heaps : SORTING (alphabetical order)	10	L3	CO3
	b.	(i) Construct an AVL tree for the list. 5, 6, 8, 3, 2, 4, 7 (ii) Construct an 2-3 tree for the list. 9, 5, 8, 3, 2, 4, 7	10	L3	CO3

OR

Q.6	a.	Discuss comparison counting sort with an algorithm. Sort the following numbers using comparison counting sort: 25 45 10 20 50 15	10	L3	CO3
	b.	Explain Horspool's algorithm for string matching. Trace Horspool's algorithm to find the pattern 'DIRECTORS' in text 'IN THE DIRECT TO DIRECTORS SITUATION'	10	L3	CO3

Module – 4

Q.7	a.	Define Transitive closure. Write Warshall's algorithm to compute transitive closure. Generate transitive closure of the graph given below:  Fig. Q7 (a)	8	L3	CO4
	b.	Apply Floyd's algorithm to find the all pair shortest path for the graph given below :  Fig. Q7 (b)	8	L3	CO4

	c.	Solve for the coin-row problem for the instance {7, 3, 9, 10, 8, 6}	4	L3	CO4												
OR																	
Q.8	a.	Apply Prim's algorithm to find the minimal cost spanning tree for the graph given :  Fig.Q8 (a)	8	L3	CO4												
	b.	Apply Dijkstra's algorithm to find single source shortest path for the given graph by considering S as the source vertex.  Fig. Q8 (b)	8	L3	CO4												
	c.	Construct a Huffman code for the following data: <table border="1" data-bbox="277 1120 828 1209"> <tr> <td>Character</td><td>A</td><td>B</td><td>C</td><td>D</td><td>-</td></tr> <tr> <td>Probabiltiy</td><td>0.4</td><td>0.1</td><td>0.2</td><td>0.15</td><td>0.15</td></tr> </table>	Character	A	B	C	D	-	Probabiltiy	0.4	0.1	0.2	0.15	0.15	4	L3	CO4
Character	A	B	C	D	-												
Probabiltiy	0.4	0.1	0.2	0.15	0.15												
Module – 5																	
Q.9	a.	Explain the following with examples : (i) Class P problems (ii) NP complete problem.	10	L1	CO5												
	b.	Give the problem statement of n-queens problem. Explain the solution for 4-queens problem using state space tree.	10	L2	CO6												
OR																	
Q.10	a.	Explain how knapsack problem can be solved using branch and bound technique, with example.	10	L3	CO6												
	b.	Discuss Decision tree for three element selection sort and binary search in a four element array.	10	L2	CO6												

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BCS402

Fourth Semester B.E/B.Tech. Degree Examination, June/July 2026 Microcontrollers

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
1	a.	Differentiate between CISC and RISC, and explain the four major rules of RISC design.	7	L2	CO1
	b.	Explain ARM core dataflow model and mention the different registers of ARM processor.	7	L2	CO1
	c.	Write a note on Exceptions, interrupts and the vector table.	6	L2	CO1
OR					
2	a.	With the help of basic layout diagram, explain the current program status register.	7	L2	CO1
	b.	With a neat diagram, explain embedded system software.	8	L2	CO1
	c.	What is pipeline in ARM? Explain the different pipeline stages of ARM 9 processor.	5	L2	CO1
Module – 2					
3	a.	Explain the different Data Processing Instruction in ARM.	10	L2	CO2
	b.	Briefly explain the different Load-Store Instruction categories used with ARM.	10	L2	CO2
OR					
4	a.	Discuss with proper syntax, the following : i) SWAP instruction ii) Software interrupt instruction.	10	L2	CO2
	b.	Write a C program that prints and square of the integers between 0 to 9 using function and explain how to convert this C function to an assembly function with command.	10	L2	CO2

Module – 3

5	a.	Discuss how registers are allocated to optimize the program in ARM processor.	10	L2	CO3
	b.	Write a note on portability issues in ARM.	10	L2	CO3

OR

6	a.	Explain the Load-Store instruction classes available by ARM architecture along with mapping C Datatypes.	10	L2	CO3
	b.	What is Pointer Aliasing? Explain function calls in ARM register.	10	L2	CO3

Module – 4

7	a.	What are interrupts or exceptions? Mentioning them, explain how they are handled in ARM processors.	7	L2	CO4
	b.	Explain the ARM firmware suite.	6	L2	CO4
	c.	Explain in detail the steps of a sandstone code structure.	7	L2	CO4

OR

8	a.	Explain Suitably, how FIQ and IRQ exceptions are enables and disabled in ARM processor.	10	L2	CO4
	b.	Explain Exception Priorities in detail with priority levels.	10	L2	CO4

Module – 5

9	a.	Explain with a neat diagram, memory hierarchy and cache memory.	8	L2	CO5
	b.	Write a note on Cache Line Replacement Policies.	6	L2	CO5
	c.	Discuss the relationship of a cache between processor core and main memory.	6	L2	CO5

OR

10	a.	Explain with a neat diagram, a four-way set associative cache to increase the set associativity.	9	L2	CO5
	b.	Write a note on allocation Policy on a Cache Miss.	6	L2	CO5
	c.	Brief out measuring of Cache Efficiency.	5	L2	CO5

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Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026

Database Management Systems

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Define DBMS. Explain the main characteristics of the database approach.	5	L2	CO1
	b.	With a neat diagram, explain Three –Schema architecture. Justify the need of mappings among schema levels.	8	L2	CO1
	c.	Write short notes on : i) DB languages ii) DB Interfaces.	7	L1	CO1
OR					
Q.2	a.	Differentiate between traditional file system Vs database systems.	5	L2	CO1
	b.	With a neat diagram, discuss various DB system environment components.	8	L2	CO1
	c.	Draw an ER diagram, for ONLINE SHOPPING database with atleast five entities. Specify primary key and participation constraints.	7	L3	CO2
Module – 2					
Q.3	a.	Explain briefly domain, key, integrity and referential integrity constraints with necessary examples.	10	L2	CO1
	b.	Consider following relations and construct Relational Algebra queries for the following : SAILOR (Sid, Sname, Rating, Age) BOAT (Bid, Bname, Color) RESERVE (Sid, Bid, Day) i) Retrieve the color of boats reserved by “Deepak” ii) Retrieve the sailor names who have reserved ‘Red’ or ‘Green’ boats iii) Retrieve the SID of sailors with age over 25 who have not reserve a boat iv) Retrieve the total count of boats reserved by each sailor	10	L3	CO2
OR					
Q.4	a.	Explain ER-to-Relational mapping algorithm with example	10	L2	CO1
	b.	Consider the following relations and construct Relations Algebra Queries. STUDENT(Sid, Sname, Major, GPA) FACULTY (Fid, Fname, Dept, Designation, Salary) COURSE (Cid, Cname, Fid) ENROLL (Cid, Sid, Grade) i) Retrieve the name of facilities who are receiving salary more than 34567.00 ii) List the name of all faculty members who teaches the course “BCS 403”. iii) List all the departments having an average salary of above 45678.00 iv) List the names of students enrolled for the course “Mastering SGC”.	10	L3	CO2

Module – 3					
Q.5	a.	Define Functional dependency. Explain 1NF and 2NF with examples.	10	L2	CO4
	b.	Explain occurrences of types of anomalies while performing SQL operations.	10	L2	CO3
OR					
Q.6	a.	What is multivalued dependency? Explain fourth normal form at examples.	10	L2	CO4
	b.	Describe the six clauses in the syntax of a SQL relational query. Show what type of constructs can be specified in each of the six clauses.	10	L2	CO3
Module – 4					
Q.7	a.	Consider following relation, construct SQL queries. EMPLOYEE (Fname, Lname, SSN, Address, Phone, Dno) DEPARTMENT (Dname, Dnumber, Mgr, SSn) PROJECT (Pname, Pnumber, Plocations) DEPENDENT (Name, Age, Relationship, Essn) WORKS ON (Pnum, EmpSSN, Hours) i) Make a list of all project number for projects that involve an employee whose last name is “Shetty: as a worker or as a manager of the department that controls the project ii) Retrieve name and address of all employees who work for the “Research” Department iii) Retrieve the name of each employees who works on all the project controlled by department number 555 iv) Find total number of employees, maximum salary, minimum salary, and average salary among employees who works for the “HR” department.	10	L3	CO3
	b.	Define Transaction processing. Explain ACID properties of transactions.	10	L2	CO3
OR					
Q.8	a.	Consider following relations, construct SQL queries SALESMAN (Salesman_id, Name, City, Commission) CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id) ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id) i) Count the customer with grades above “GOA”s average ii) Find the name and numbers of all salesman who have more than one customer iii) List all salesman and indicate those who have and don’t have customer in their cities (USING-UNION) iv) Demonstrate delete operation by removing salesman with ID 1008.	10	L3	CO3
	b.	Define Serializability, Elaborate characterizing schedules based on serializability.	10	L2	CO4
Module – 5					
Q.9	a.	Elaborate 2PL techniques for concurrency control.	10	L2	CO4
	b.	Explain optimistic concurrency control techniques.	10	L2	CO4
OR					
Q.10	a.	Explain Column-Family store database with a neat diagram.	10	L2	CO4,5
	b.	Explain in detail CAP Theorem.	10	L2	CO4,5

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Fourth Semester B.E./B.Tech. Degree Examination, June / July 2026

Discrete Mathematical Structures

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Define a Tautology. Verify that $[p \rightarrow (q \rightarrow r)] \rightarrow [(p \rightarrow q) \rightarrow (p \rightarrow r)]$ is a tautology by constructing the truth table.	06	L2	CO1
	b.	Check whether the following is a valid argument. If I study, then I will not fail in the examination If I don't watch TV in the evening, I will study I failed in the examination ----- $\therefore$ I must watch TV in the evening.	07	L3	CO1
	c.	Show that for all odd integers. i) The sum of two odd integers is even. ii) The product of two odd integer is odd.	07	L2	CO1
OR					
Q.2	a.	Prove the following Logical equivalences by using the laws of logic. $[\sim p \wedge (\sim q \wedge r)] \vee [(q \wedge r) \vee (p \wedge r)] \Leftrightarrow r$	06	L2	CO1
	b.	Establish the validity of the following argument : $\forall x, [p(x) \vee q(x)]$ $\exists x, \sim p(x)$ $\forall x, [\sim q(x) \vee r(x)]$ $\forall x, [s(x) \rightarrow \sim r(x)]$ ----- $\therefore \exists x, \sim s(x)$	07	L3	CO1
	c.	Give : i) A direct proof ii) A proof by contradiction for the following statement. “If n is an odd integer, then $(n+9)$ is an even integer”.	07	L2	CO1
Module – 2					
Q.3	a.	Prove the following statement by mathematical induction $1.3 + 2.4 + 3.5 + \dots + n(n+2) = \frac{n(n+1)(2n+7)}{6}$	06	L2	CO2
	b.	Find the number of permutations of the letters of the word ENGINEERING such that i) all the E's are together ii) G and R are next to each other iii) all the vowels are adjacent	07	L3	CO2
	c.	Find the Co-efficient of $a^3b^2cd^2$ in the expansions of $(2a - b + 3c - 2d)^8$	07	L2	CO2

OR

Q.4	a.	Prove the following results by mathematical induction $2^n > n$, whenever n is a positive integer than equal to 1.	06	L2	CO2
	b.	If $F_0, F_1, F_2, \dots$ are Fibonacci numbers prove that $F_n = \frac{1}{\sqrt{5}} \left[\left(\frac{1+\sqrt{5}}{2} \right)^n - \left(\frac{1-\sqrt{5}}{2} \right)^n \right]$	07	L3	CO2
	c.	In how many ways can 10 identical dimes be distributed among 5 children if i) there are no restrictions ii) each child gets atleast 1 dimes iii) The oldest child gets atleast 2 dimes.	07	L2	CO2

Module – 3

Q.5	a.	State pigeon – hole principle. Find the least number of pages contained in a book. 6 books each of maths, DMS, CO and UNIX and 4 books of ADE and DS. Totally contain 10416 pages.	06	L3	CO3
	b.	Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = \begin{cases} 3x-5, & \text{if } x > 0 \\ 1-3x, & \text{if } x \leq 0 \end{cases}$ find $f(1), f^{-1}(-1), f^{-1}([-5, 5])$	07	L3	CO3
	c.	If A is set of positive real number and f, g are functions on A defined by $f(x) = (2x+5)^3$ and $g(x) = \frac{\sqrt[3]{x}-5}{2}$. S.T functions f and g are invertible.	07	L2	CO3

OR

Q.6	a.	Let $A = \{1, 2, 3, 6, 9, 12, 18\}$. Define a relation 'R' on 'A' as xRy if x divides y . Draw the Hasse diagram of poset (A, R) .	06	L3	CO3
	b.	Let $A = \{1, 2, 3, 4, 6\}$ & R be a relation of A defined by aRb if and only if 'a' is a multiple of 'b'. Represent 'R' as a set of ordered pairs. Draw the digraph and matrix representation of 'R'.	07	L3	CO3
	c.	If $f: A \rightarrow B, g: B \rightarrow C, h: C \rightarrow D$ are three functions then prove that $h \circ (g \circ f) = (h \circ g) \circ f$.	07	L2	CO3

Module – 4

Q.7	a.	There are 8 letters to 8 different people to be placed in 8 different addressed envelopes. Find the number of ways of doing this so that atleast one letter gets to the right person.	06	L3	CO4
	b.	Determine in how many ways can the letters in the word ARRANGEMENT be arranged so that : i) none of the pairs ii) atleast one pair	07	L3	CO4
	c.	Solve the recurrence relation $F_{n+2} = F_{n+1} + F_n$ where $n \geq 0$ and $F_0 = 0, F_1 = 1$.	07	L3	CO4

OR

Q.8	a.	Obtain the unique solution of the recurrence relation $a_n = a_{n-1} + n, \quad n \geq 2, \quad a_1 = 4.$	06	L2	CO4
	b.	In how many ways can the 26 letters of English alphabet be permuted, so that none of the patterns CAR, DOG, PUN or BYTE occurs.	07	L3	CO4
	c.	Find the rook polynomial for the 3×3 board by using the expansion formula.	07	L3	CO4

Module – 5

Q.9	a.	Show that fourth roots of unity is an abelian group.	06	L2	CO5
	b.	Let $G = S_4$, for $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{pmatrix}$ find the Subgroup $H = \langle a \rangle$. Determine the left co-sets of H in G.	07	L3	CO5
	c.	State and prove Lagrange's Theorem.	07	L2	CO5

OR

Q.10	a.	Define a Group. Show that any group G is abelian iff $(ab)^2 = a^2b^2$ and $a, b \in G$.	06	L2	CO5
	b.	In the group S_5 Let $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 1 & 4 & 5 \end{pmatrix}$ and $\beta = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 1 & 5 & 3 & 4 \end{pmatrix}$ Determine the $\alpha\beta, \beta\alpha, \alpha^{-1}, \beta^{-1}, \beta^{-1}\alpha^{-1}$.	07	L3	CO5
	c.	If H, K are subgroups of a group G, prove that $H \cap K$ is also a subgroup of G. Is $H \cup K$ a subgroup of G?	07	L2	CO5

CBCS SCHEME

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Question Paper Version : A

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026 UI/UX

Time: 1 hr.

Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

-
1. What is the usability primarily concerned with?
 - a) Aesthetic
 - b) Functionality
 - c) Ease of use
 - d) Branding
 2. _____ plays a role to bridge up the gap between the interfaces of machine and human understanding
 - a) Human
 - b) Human compute interaction
 - c) Computer
 - d) None of the above
 3. What does "UX" stands for in web design?
 - a) User experience
 - b) Universal experience
 - c) User expertise
 - d) Universal expertise
 4. What is the main goal of UX design?
 - a) Maximize user satisfaction
 - b) Creating visually appealing product
 - c) Reducing development cost
 - d) Enhancing brand recognition

5. What is the primary difference between usability and UX?
 - a) Usability concerned with aesthetics, while UX is not
 - b) Usability focus on ease of use, while UX includes emotional reasons
 - c) UX only applied to digital product, while usability applies to all the product
 - d) Usability includes branding, while UX not
6. What is needed to design a system the will fulfill user and customer goals?
 - a) Requirements
 - b) Software's
 - c) Computers
 - d) Planning
7. Which of the following is output from possible requirement extraction process
 - a) Questions about missing data
 - b) Taking requirements back to customers and users for validation
 - c) Resolve organizational, sociological and personal issues with customer
 - d) All of these
8. Crafting a Point of View (POV) requires 3 key elements except the
 - a) Design
 - b) User
 - c) Insight
 - d) Need
9. Detailed formal requirements cannot ever be 100% correct
 - a) True
 - b) False
10. Create a plan to gather emotional feedback from users of a new application is by
 - a) Conduct Performance Testing
 - b) Perform code reviews
 - c) Increase marketing efforts
 - d) Implement user surveys and feedback forms
11. What are the steps of the design thinking process?
 - a) Understand – Draw – Ideate – Create – Test
 - b) Empathies – Define – Ideate – Prototype – Test
 - c) Empathies – Design – Implement – Produce – Test
 - d) Understand – Define – Ideate – produce – Try
12. Which stage of design thinking involves understanding the needs of users?
 - a) Ideation
 - b) Prototyping
 - c) Empathies
 - d) Define
13. Ecological design perspective is about _____
 - a) How the system or product works within its external environment
 - b) How users operate the system or product
 - c) Emotional impact
 - d) Value sensitive aspect of design
14. Which of the following is not a characteristics of design thinking?
 - a) Iterative
 - b) Human –centered
 - c) Collaborative
 - d) Linear process

15. Which of the following is important while constructing the primary persona?
a) Specificity b) Accuracy c) Simplicity d) None of these
16. Design thinking typically helps in _____.
a) Innovation
b) Data analytics
c) Financial planning
d) Operational efficiency
17. A mental model is an explanation of some one's thought process about how something works in the real world".
a) True b) False
18. Which of the below firm is associated the most with design thinking?
a) Ikea b) Ikei c) Idea d) Ideo
19. Pixel – perfect mockup of the graphical skin for look and feel appearance is
a) Visual comp
b) Visual design
c) Wire frames
d) All of these
20. Unfinished looks during early stages of design without any visual content s are called
a) Visual design
b) Prototypes
c) Wireframes
d) All of these
21. A _____ is a usage attribute to be assessed in evaluating a _____.
a) UX goal, UX measure
b) UX measure, UX goal
c) UI measure, UI goal
d) UI goal, UI measure
22. Primary purpose of wire framing in web design is
a) To create fully functional web pages
b) To outline the layout and structure of web pages
c) To optimize website performance
d) To design engaging animations and transitions
23. UX goals are
a) High level objectives
b) Anticipated user experience
c) Driven by business goals
d) All of these
24. Wireframes can be built using
a) iworkpages b) keynote c) MS-word d) All of these
25. UX measure is the general user experience characteristic to be measured with respect to usage of interaction design
a) True b) False

26. UX targets based on
- a) Observable user performance
 - b) User opinion and satisfaction
 - c) Both of these
 - d) None of the above
27. Which of the following are objective UX measures
- a) Long- term user satisfaction
 - b) First impression
 - c) Last impression
 - d) Initial performance, learn ability, retainability
28. Time to complete task 1, number of errors made by the user, time spent errors and recovery commands are examples of
- a) UX metrics
 - b) UX goals
 - c) UX targets
 - d) None of these
29. Constraints are
- a) Design
 - b) Requirements
 - c) Testing
 - d) Usability
30. Which methods are heavy weight processes that required enormous investment of time money and personnel?
- a) Object-oriented
 - b) Agile
 - c) Waterfall
 - d) All of these
31. Prototype is a mechanism which offers design teams to observe something about
- a) Evaluating ideas
 - b) Weighting alternatives
 - c) Seeing what works and what not
 - d) All of these
32. Which prototype is effective in demonstrating the product concept and conveying an early product overview?
- a) Horizontal prototype
 - b) Vertical prototype
 - c) Upper prototype
 - d) None of these
33. A prototype gives you something to evaluate before you have to commit resources to build the real thing
- a) True
 - b) False
34. Paper prototypes are early versions which are just about
- a) Interaction not functionality
 - b) No use of real widgets
 - c) Can act as a coding blocker
 - d) All of these
35. Which prototype support realistic user experience evaluation?
- a) Horizontal prototype
 - b) Vertical prototype

36. Which prototypes are not faithful representations of detail look, feel and behaviour?
- a) Horizontal prototype
 - b) Vertical prototype
 - c) Low fidelity prototype
 - d) High fidelity prototype
37. Tool to make computer printable screens are
- a) OmniGraffle
 - b) Keynote
 - c) Acrobat reader
 - d) WinZip
38. A prototype which gives more detailed representation of design, appearance, behavior
- a) Horizontal prototype
 - b) Vertical prototype
 - c) Low fidelity prototype
 - d) High fidelity prototype
39. Communication, coordination and synchronization are important in SE – UX
- a) True
 - b) False
40. UX people are constantly iterating even after last usability testing session
- a) True
 - b) False
41. Smith and Mosier of Mitre corporation developed 944 _____ guidelines for test based user interface for the US Air force
- a) Requirement
 - b) Design
 - c) Testing
 - d) Interface
42. Which memory is one of the few areas of psychology that has solid empirical data supporting knowledge in UX design?
- a) Short memory
 - b) Sensory memory
 - c) Human memory
 - d) Working memory
43. Information stored in short-term to long-term memory by _____
- a) Learning
 - b) Transferring
 - c) Updating
 - d) All
44. Memory that allows us to integrated the fast moving sequences is _____
- a) Sensory memory
 - b) Short memory
 - c) Chunking
 - d) Stacking

45. _____ is the load on working memory at a specific point in time
- a) Sensory load
 - b) Working memory
 - c) Chunking
 - d) Cognitive load
46. Which of the following is all time favorite UX design guideline
- a) Be consistent
 - b) Means should be less
 - c) Keep it simple
 - d) Add colours
47. In which stage of interaction cycle has details of “User task progress”?
- a) Physical actions
 - b) Translation
 - c) Planning
 - d) Assessments
48. Design issues related to Fitt’s law are about
- a) Movement distances
 - b) Mutual object proximities
 - c) Target object sizes
 - d) All of these
49. Physical actions in UI design include
- a) Hand movement, leg and body movement
 - b) Typing, clicking, dragging, scrolling
 - c) Speaking, Walking in virtual environment, moving hand in gesture interaction, gazing with eyes
 - d) both b and c
50. Simplest view of the interaction cycle involves
- a) Planning, translation, physical action
 - b) Outcomes, assessments
 - c) Interfaces, Testing
 - d) Both a and b

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CBCS SCHEME

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Question Paper Version : B

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025 UI/UX

Time: 1 hr.

Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

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-
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 - a) Horizontal prototype
 - b) Vertical prototype
 - c) Upper prototype
 - d) None of these
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 - a) True
 - b) False
 - 4 Paper prototypes are early versions which are just about
 - a) Interaction not functionality
 - b) No use of real widgets
 - c) Can act as a coding blocker
 - d) All of these

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b) Typing, clicking, dragging, scrolling
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- 30 Simplest view of the interaction cycle involves
a) Planning, translation, physical action
b) Outcomes, assessments
c) Interfaces, Testing
d) Both a and b
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d) Linear process
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a) Visual comp
b) Visual design
c) Wire frames
d) All of these
- 50 Unfinished looks during early stages of design without any visual content s are called
a) Visual design
b) Prototypes
c) Wireframes
d) All of these

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CBCS SCHEME

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Question Paper Version : C

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025 UI/UX

Time: 1 hr.

Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

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-
- 1 A _____ is a usage attribute to be assessed in evaluating a _____
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b) UX measure, UX goal
c) UI measure, UI goal
d) UI goal, UI measure
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d) To design engaging animations and transitions
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b) Anticipated user experience
c) Driven by business goals
d) All of these
 - 4 Wireframes can be built using
a) iworkpages
b) keynote
c) MS-word
d) All of these
 - 5 UX measure is the general user experience characteristic to be measured with respect to usage of interaction design
a) True
b) False

- 6 UX targets based on
a) Observable user performance
b) User opinion and satisfaction
c) Both of these
d) None of the above
- 7 Which of the following are objective UX measures
a) Long- term user satisfaction
b) First impression
c) Last impression
d) Initial performance, learn ability, retainability
- 8 Time to complete task 1, number of errors made by the user, time spent errors and recovery commands are examples of
a) UX metrics
b) UX goals
c) UX targets
d) None of these
- 9 Constraints are
a) Design b) Requirements c) Testing d) Usability
- 10 Which methods are heavy weight processes that required enormous investment of time money and personnel?
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c) Human memory
d) Working memory
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a) Learning
b) Transferring
c) Updating
d) All
- 14 Memory that allows us to integrated the fast moving sequences is _____
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 - d) Add colours
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- 18 Design issues related to Fitt’s law are about
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- 19 Physical actions in UI design include
- a) Hand movement, leg and body movement
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 - c) Speaking, Walking in virtual environment, moving hand in gesture interaction, gazing with eyes
 - d) both b and c
- 20 Simplest view of the interaction cycle involves
- a) Planning, translation, physical action
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 - c) Interfaces, Testing
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- 21 Prototype is a mechanism which offers design teams to observe something about
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- 23 A prototype gives you something to evaluate before you have to commit resources to build the real thing
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- 24 Paper prototypes are early versions which are just about
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c) Empathies – Design – Implement – Produce – Test
d) Understand – Define – Ideate – produce – Try
- 32 Which stage of design thinking involves understanding the needs of users?
a) Ideation b) Prototyping c) Empathies d) Define
- 33 Ecological design perspective is about _____
a) How the system or product works within its external environment
b) How users operate the system or product
c) Emotional impact
d) Value sensitive aspect of design

- 34 Which of the following is not a characteristics of design thinking?
a) Iterative
b) Human –centered
c) Collaborative
d) Linear process
- 35 Which of the following is important while constructing the primary persona?
a) Specificity b) Accuracy c) Simplicity d) None of these
- 36 Design thinking typically helps in _____.
a) Innovation
b) Data analytics
c) Financial planning
d) Operational efficiency
- 37 A mental model is an explanation of some ones thought process about how something works in the real world”.
a) True b) False
- 38 Which of the below firm is associated the most with design thinking?
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b) Visual design
c) Wire frames
d) All of these
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- 41 What is the usability primarily concerned with?
a) Aesthetic
b) Functionality
c) Ease of use
d) Branding
- 42 _____ plays a role to bridge up the gap between the interfaces of machine and human understanding
a) Human
b) Human compute interaction
c) Computer
d) None of the above
- 43 What does “UX” stands for in web design?
a) User experience
b) Universal experience
c) User expertise
d) Universal expertise

- 44 What is the main goal of UX design?
- a) Maximize user satisfaction
 - b) Creating visually appealing product
 - c) Reducing development cost
 - d) Enhancing brand recognition
- 45 What is the primary difference between usability and UX?
- a) Usability concerned with aesthetics, while UX is not
 - b) Usability focus on ease of use, while UX includes emotional reasons
 - c) UX only applied to digital product, while usability applies to all the product
 - d) Usability includes branding, while UX not
- 46 What is needed to design a system the will fulfill user and customer goals?
- a) Requirements
 - b) Software's
 - c) Computers
 - d) Planning
- 47 Which of the following is output from possible requirement extraction process
- a) Questions about missing data
 - b) Taking requirements back to customers and users for validation
 - c) Resolve organizational, sociological and personal issues with customer
 - d) All of these
- 48 Crafting a Point of View (POV) requires 3 key elements except the
- a) Design
 - b) User
 - c) Insight
 - d) Need
- 49 Detailed formal requirements cannot ever be 100% correct
- a) True
 - b) False
- 50 Create a plan to gather emotional feedback from users of a new application is by
- a) Conduct Performance Testing
 - b) Perform code reviews
 - c) Increase marketing efforts
 - d) Implement user surveys and feedback forms

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CBCS SCHEME

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Question Paper Version : D

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025 UI/UX

Time: 1 hr.

Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

-
- 1 Smith and Mosier of Mitre corporation developed 944 _____ guidelines for test based user interface for the US Air force
 - a) Requirement
 - b) Design
 - c) Testing
 - d) Interface
 - 2 Which memory is one of the few areas of psychology that has solid empirical data supporting knowledge in UX design?
 - a) Short memory
 - b) Sensory memory
 - c) Human memory
 - d) Working memory
 - 3 Information stored in short-term to long-term memory by _____
 - a) Learning
 - b) Transferring
 - c) Updating
 - d) All
 - 4 Memory that allows us to integrated the fast moving sequences is _____
 - a) Sensory memory
 - b) Short memory
 - c) Chunking
 - d) Stacking

- 5 _____ is the load on working memory at a specific point in time
- Sensory load
 - Working memory
 - Chunking
 - Cognitive load
- 6 Which of the following is all time favorite UX design guideline
- Be consistent
 - Means should be less
 - Keep it simple
 - Add colours
- 7 In which stage of interaction cycle has details of “User task progress”?
- Physical actions
 - Translation
 - Planning
 - Assessments
- 8 Design issues related to Fitt’s law are about
- Movement distances
 - Mutual object proximities
 - Target object sizes
 - All of these
- 9 Physical actions in UI design include
- Hand movement, leg and body movement
 - Typing, clicking, dragging, scrolling
 - Speaking, Walking in virtual environment, moving hand in gesture interaction, gazing with eyes
 - both b and c
- 10 Simplest view of the interaction cycle involves
- Planning, translation, physical action
 - Outcomes, assessments
 - Interfaces, Testing
 - Both a and b
- 11 Prototype is a mechanism which offers design teams to observe something about
- Evaluating ideas
 - Weighting alternatives
 - Seeing what works and what not
 - All of these
- 12 Which prototype is effective in demonstrating the product concept and conveying an early product overview?
- Horizontal prototype
 - Vertical prototype
 - Upper prototype
 - None of these

- 13 A prototype gives you something to evaluate before you have to commit resources to build the real thing
a) True b) False
- 14 Paper prototypes are early versions which are just about
a) Interaction not functionality
b) No use of real widgets
c) Can act as a coding blocker
d) All of these
- 15 Which prototype support realistic user experience evaluation?
a) Horizontal prototype b) Vertical prototype
- 16 Which prototypes are not faithful representations of detail look, feel and behaviour?
a) Horizontal prototype
b) Vertical prototype
c) Low fidelity prototype
d) High fidelity prototype
- 17 Tool to make computer printable screens are
a) OmniGraffle
b) Keynote
c) Acrobat reader
d) WinZip
- 18 A prototype which gives more detailed representation of design, appearance, behavior
a) Horizontal prototype
b) Vertical prototype
c) Low fidelity prototype
d) High fidelity prototype
- 19 Communication, coordination and synchronization are important in SE – UX
a) True b) False
- 20 UX people are constantly iterating even after last usability testing session
a) True b) False
- 21 What are the steps of the design thinking process?
a) Understand – Draw – Ideate – Create – Test
b) Empathies – Define – Ideate – Prototype – Test
c) Empathies – Design – Implement – Produce – Test
d) Understand – Define – Ideate – produce – Try
- 22 Which stage of design thinking involves understanding the needs of users?
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- a) Conduct Performance Testing
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 - c) Increase marketing efforts
 - d) Implement user surveys and feedback forms
- 41 A _____ is a usage attribute to be assessed in evaluating a _____
- a) UX goal, UX measure
 - b) UX measure, UX goal
 - c) UI measure, UI goal
 - d) UI goal, UI measure
- 42 Primary purpose of wire framing in web design is
- a) To create fully functional web pages
 - b) To outline the layout and structure of web pages
 - c) To optimize website performance
 - d) To design engaging animations and transitions
- 43 UX goals are
- a) High level objectives
 - b) Anticipated user experience
 - c) Driven by business goals
 - d) All of these

- 44 Wireframes can be built using
a) iworkpages
b) keynote
c) MS-word
d) All of these
- 45 UX measure is the general user experience characteristic to be measured with respect to usage of interaction design
a) True
b) False
- 46 UX targets based on
a) Observable user performance
b) User opinion and satisfaction
c) Both of these
d) None of the above
- 47 Which of the following are objective UX measures
a) Long- term user satisfaction
b) First impression
c) Last impression
d) Initial performance, learn ability, retainability
- 48 Time to complete task 1, number of errors made by the user, time spent errors and recovery commands are examples of
a) UX metrics
b) UX goals
c) UX targets
d) None of these
- 49 Constraints are
a) Design
b) Requirements
c) Testing
d) Usability
- 50 Which methods are heavy weight processes that required enormous investment of time money and personnel?
a) Object-oriented
b) Agile
c) Waterfall
d) All of these

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CBCS SCHEME

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21CS51

Fifth Semester B.E./B.Tech. Degree Examination, June / July 2026 Automata Theory and Compiler Design

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define the following terms :
 - (i) Alphabet
 - (ii) String
 - (iii) Length of String
 - (iv) Power of an alphabet
 - (v) Language

(05 Marks)
- b. Design DFA for the following languages over $\Sigma = \{ a, b \}$
 - i) $L = \{ w : |w| \bmod 3 > |w| \bmod 2 \}$
 - ii) The set of all strings containing the substring 'ab' at the end.

(08 Marks)
- c. Convert the following NFA to its equivalent DFA.

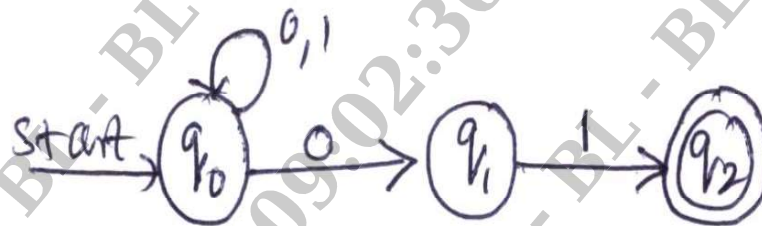


Fig. Q. 1 (c)

(07 Marks)

OR

- 2 a. Construct a minimized DFA for the following:

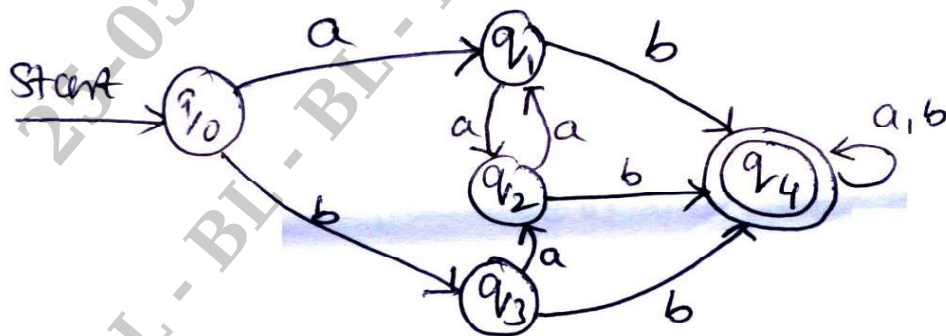


Fig. Q. 2 (a)

(08 Marks)

- b. With the help of a diagram, explain various phases of compiler. Also show the steps in translation of an assignment statement.

Position = initial + rate * 60

(12 Marks)

Module-2

- 3 a. Define Regular expression. Construct the regular expressions for the following languages:

(i) Strings of a's and b's whose 3rd symbol from right is a

(ii) $L = \{ a^{2n} b^{2m+1} : m \geq 0, n \geq 0 \}$

(06 Marks)

- b. Construct an equivalent regular expression for the following DFA using state elimination method.



Fig. Q. 3 (b)

(08 Marks)

- c. Convert the regular expression $(0 + 1)^* 1 (0 + 1)$ to a ϵ -NFA.

(06 Marks)

OR

- 4 a. With a neat diagram explain input buffering schemes of lexical analyses.

(10 Marks)

- b. Construct the transition diagrams to recognize the following tokens.

i) relopertors ii) id and keywords iii) Unsigned numbers

(10 Marks)

Module-3

- 5 a. Define Context free Grammar. Obtain the CFG for the following languages:

i) $L = \{ a^m b^n : m \geq 1, n \geq 1 \}$

ii) $L = \{ 0^n 1^n : n \geq 0 \}$

(06 Marks)

- b. Consider the following CFG with productions.

$E \rightarrow E + T \mid T$

$T \rightarrow T * F \mid F$

$F \rightarrow (E) \mid \text{id},$

Write the LMD, RMD and Parse tree for the string $\text{id} * (\text{id} + \text{id})$.

(09 Marks)

- c. Consider the CFG given in Q. 5 (b), eliminate the left recursion.

(05 Marks)

OR

- 6 a. With a net diagram explain the rule of a Parser. (05 Marks)
- b. Consider the grammar,
 $S \rightarrow iEtSS' \mid a$
 $S' \rightarrow eS \mid \epsilon$
 $E \rightarrow b$
 Construct Predictive Parsing table. (10 Marks)
- c. Briefly explain error recovery strategies of Predictive Parser. (05 Marks)

Module-4

- 7 a. Define PDA. Explain the working of PDA with a neat diagram. (05 Marks)
- b. Design a PDA to accept the language
 $L = \{ WW^R \mid W \in \{a, b\}^* \}$ by a final state. (05 Marks)
- c. What is Shift- Reduce Parsing? List the possible actions. Show the configurations of a Shift – Reduce Parser on the input $id_1 * id_2$. (10 Marks)

OR

- 8 a. Construct the SLR Parsing table for the grammar given in Q. 5 (b). (12 Marks)
- b. Construct LR(1) Automation for the grammar
 $S \rightarrow CC$, $C \rightarrow cC \mid d$ (08 Marks)

Module-5

- 9 a. With a neat diagram, explain the working of basic Turing machine. (05 Marks)
- b. Design a Turing machine to accept the language
 $L = \{ 0^n 1^n \mid n \geq 1 \}$ (10 Marks)
- c. Write a short note on multitape Turing machine. (05 Marks)

OR

- 10 a. Give SDD for a simple desk calculator. (05 Marks)
- b. Construct DAG for the expression
 $a + a * (b - c) + (b - c) * d$ (05 Marks)
- c. List and briefly explain the issues in the design of a code generator. (10 Marks)

CBCS SCHEME

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21CS52

Fifth Semester B.E./B.Tech. Degree Examination, June / July 2026 Computer Networks

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain categories of Network and differentiate between them. (10 Marks)
- b. Explain ISO – OSI Reference model in detail. (10 Marks)

OR

- 2 a. What are the design issues of layers? (05 Marks)
- b. Differentiate between Connection Oriented and Connectionless Service. (05 Marks)
- c. What are the advantages of Fibre Optic Cable? Explain with a neat sketch. (10 Marks)

Module-2

- 3 a. Explain the various Framing Techniques of Data link layer. (10 Marks)
- b. Explain about simplex stop and wait protocol for noisy channel. (10 Marks)

OR

- 4 a. Explain Pure ALOHA and Slotted ALOHA channel allocation method in detail. (10 Marks)
- b. Explain about CRC error detection method with suitable example. (10 Marks)

Module-3

- 5 a. Define Routing. Explain Distance Vector Routing Algorithm with example. (10 Marks)
- b. What are the advantages and limitations of flooding? (05 Marks)
- c. Compare Datagram Network and Virtual Circuit. (05 Marks)

OR

- 6 a. Define Congestion. Write about approaches to congestion control. (10 Marks)
- b. How to achieve QoS using Leaky Bucket Algorithm? (10 Marks)

Module-4

- 7 a. What are the services provided by Transport layer to the upper layer? (05 Marks)
- b. What are the Primitives of a Transport layer? (05 Marks)
- c. Explain the Connection Establishment and connection release in transport layer. (10 Marks)

OR

- 8 a. Explain each field in TCP Header with neat diagram. (10 Marks)
- b. Explain how to regulate the sending rate to obtain desirable bandwidth allocation? (10 Marks)

Module-5

- 9 a. Explain DNS Resource record and message in detail. (10 Marks)
- b. Explain FTP with its command and replies. (10 Marks)

OR

- 10 a. What are the major components in E-mail System? Explain the role of SMTP for Sending and receiving Messages. (10 Marks)
- b. Discuss about HTTP request and response mechanisms. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

CBCS SCHEME

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21CS53

Fifth Semester B.E./B.Tech. Degree Examination, June / July 2026 Database Management Systems

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define Database and DBMS with examples. (04 Marks)
- b. Describe 3 schema architecture. (06 Marks)
- c. List and explain advantages of using DBMS. (10 Marks)

OR

- 2 a. List and explain types of attributes in ER – Model. (10 Marks)
- b. Explain Cardinality ratio in detail. (05 Marks)
- c. Define weak entity and Identifying relationship with an example. (05 Marks)

Module-2

- 3 a. Explain Relational Model Constraints in detail. (06 Marks)
- b. Explain the characteristics of Relational model. (06 Marks)
- c. Explain Join operation and Division operation with an example. (08 Marks)

OR

- 4 a. Explain the different types of update operations on relational Database. How basic operation deals with constraint Violation. (06 Marks)
- b. Explain UNION and Intersection operation with an example. (04 Marks)
- c. List and explain steps in ER to Relational mapping algorithm with an example for each step. (10 Marks)

Module-3

- 5 a. Write a note on data types in SQL. (06 Marks)
- b. Explain INSERT, DELETE, UPDATE and ALTER statements in SQL. (08 Marks)
- c. Explain Substring Pattern Matching and use of Arithmetic Operators in SQL. (06 Marks)

OR

- 6 a. Write a note on Views. (06 Marks)
- b. Explain trigger with an example. (06 Marks)
- c. What is cursor? With simple program, explain how tuples are retrieved using cursor. (08 Marks)

Module-4

- 7 a. Write a note on Insertion and Deletion Anomalies. (06 Marks)
b. Explain in detail the 4 informal design guidelines to determine the quality of relation schema design with example. (08 Marks)
c. What is Functional Dependency? Explain inference rules of functional dependency. (06 Marks)

OR

- 8 a. What do you mean by a normalization of a relation? With suitable example, explain 1NF, 2NF and 3NF. (10 Marks)
b. Write an algorithm to find the closure of Functional dependency 'F'. (05 Marks)
c. What is Equivalence of sets of functional dependencies? Explain with an example. (05 Marks)

Module-5

- 9 a. Define Transaction. Discuss ACID properties. (06 Marks)
b. With the neat diagram explain state transition diagram of transaction. (06 Marks)
c. Explain 2 phase locking mechanism with suitable example. (08 Marks)

OR

- 10 a. Write a note on :
i) Deadlock prevention protocols (10 Marks)
ii) Basic timestamp ordering algorithm. (10 Marks)
b. Explain Binary locks and shared locks with algorithms. (10 Marks)

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21CS54

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026 Artificial Intelligence and Machine Learning

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define Artificial Intelligence. Explain the functions of Artificial Intelligence. (10 Marks)
- b. List the Applications of Artificial Intelligence. Explain any one in detail. (10 Marks)

OR

- 2 a. Compare DFS and BFS. (10 Marks)
- b. List the Search Algorithms. Explain any one in detail. (10 Marks)

Module-2

- 3 a. Define Machine Learning. Explain the different types of Machine Learning. (08 Marks)
- b. Explain the applications of Machine Learning. (08 Marks)
- c. Write an algorithm for Recursive Best-First Search. (04 Marks)

OR

- 4 a. Explain the Properties of A* algorithm. (10 Marks)
- b. Explain the challenges of Machine Learning. (10 Marks)

Module-3

- 5 a. Explain steps of Find-S algorithm in detail. (10 Marks)
- b. Explain steps of weighted K-nearest neighbor algorithm in Machine Learning with an example. (10 Marks)

OR

- 6 a. List and explain different Validation of Regression method. (10 Marks)
- b. Explain limitations of Regression. (10 Marks)

Module-4

- 7 a. Define Decision Tree? Explain the advantages and disadvantages of Decision Tree (10 Marks)
- b. Explain the step ID3 Tree construction in Decision Tree Induction algorithm. (10 Marks)

OR

- 8 a. Explain Naive Bayes Algorithm with an example. (10 Marks)
- b. Explain Brute Force Bayes algorithm with an example (10 Marks)

Module-5

- 9 a. Define Perceptron? List the components of a perceptron and explain the algorithm of a Perceptron in Artificial Neural Network. (10 Marks)
- b. Explain the different types of Artificial Neural Network. (10 Marks)

OR

- 10 a. Explain the limitations of Artificial Neural Network. (05 Marks)
- b. Define Clustering. Write the advantages and disadvantages of clustering. (05 Marks)
- c. Define Fuzzy clustering. Explain the algorithm of Fuzzy clustering means. (10 Marks)

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CBCS SCHEME

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BCS501

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026 Software Engineering and Project Management

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Explain software application domains.	10	L2	CO1
	b.	Explain software engineering layers.	05	L2	CO1
	c.	Explain software engineering myths.	05	L2	CO1
OR					
Q.2	a.	Explain steps involved in generic software process.	10	L2	CO1
	b.	Explain the Waterfall Model and V-Model of software development process with a neat diagram.	10	L2	CO1
Module – 2					
Q.3	a.	Explain steps involved in requirement engineering process.	10	L2	CO2
	b.	Explain tasks involved in establishing ground work for requirement engineering.	05	L2	CO2
	c.	Explain use case diagram for 'Safehome' home security function.	05	L2	CO2
OR					
Q.4	a.	Explain the thumb rules that should be followed when creating analysis model.	06	L2	CO2
	b.	Explain elements of analysis model with a neat diagram.	06	L2	CO2
	c.	Explain the safe home security function with a neat sequence diagram.	08	L2	CO2
Module – 3					
Q.5	a.	Explain the agile process.	10	L2	CO3
	b.	Explain extreme programming process with a neat diagram.	10	L2	CO3
OR					
Q.6	a.	Explain the principles that guide practice.	10	L2	CO3
	b.	Explain the principles that guide communication.	10	L2	CO3
Module – 4					
Q.7	a.	Explain the importance of project management.	06	L2	CO4
	b.	Explain the activities covered by software project management.	06	L2	CO4
	c.	Explain about Project Management Life Cycle.	08	L2	CO4
OR					
Q.8	a.	Differentiate between Traditional versus Modern Project Management practices.	10	L2	CO4
	b.	Explain the cost benefit evaluation techniques.	10	L2	CO4
Module – 5					
Q.9	a.	Explain about importance of software quality.	10	L2	CO5
	b.	Explain software quality and the software quality models.	10	L2	CO5
OR					
Q.10	a.	Explain the observations on software project estimation.	10	L2	CO5
	b.	Explain the decomposition techniques.	10	L2	CO5

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Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026

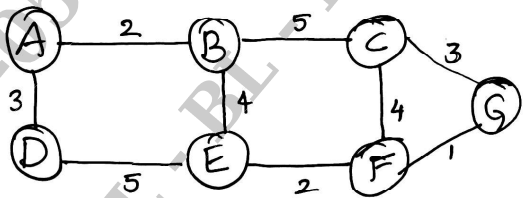
Computer Networks

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Define Data Communication. Identify five components of a data communications system. What are the three criteria's necessary for an effective and efficient network.	10	L2	CO1
	b.	Explain Fundamental characteristics of Data Communication, Categorize four basic topologies, cite and advantage of each type.	10	L2	CO1
OR					
Q.2	a.	With a neat diagram, explain TCP/IP reference model.	10	L2	CO1
	b.	What are the three major classes of guided media? Enlist the advantages of optical fiber over twisted pair and co-axial cable.	10	L2	CO1
Module – 2					
Q.3	a.	When a bit stream is transmitted using CRC coding with a generator polynomial $x^3 + x + 1$ for the data word $x^3 + 1$. Perform CRC encoding and decoding. Show the decoding case for corrupted and uncorrupted word.	10	L3	CO2
	b.	Explain the working of stop and wait protocol.	10	L2	CO2
OR					
Q.4	a.	Explain with a neat diagram Transition phases of point-to point protocol.	10	L2	CO1
	b.	Illustrate Three Controlled Access Methods with neat representation. Design a scenario with 4-5 devices in a star/ring topology and demonstrate how token passing ensures orderly data transmission.	10	L3	CO2
Module – 3					
Q.5	a.	Apply Dijkstra's algorithm to find the shortest path in a network given a topology as in the Fig Q5(a) 	10	L3	CO2
	b.	Analyze the performance of a packet switched network during high traffic load. How does packswitching handle network congestion in comparison to circuit switching?	10	L4	CO3

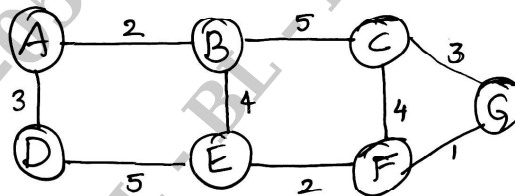


Fig Q5(a)

OR					
Q.6	a.	Write a Pseudocode for Distance Vector Routing (DVR) Algorithm, which enables nodes in network to update their routing tables. Demonstrate how the each node determines the shortest path.	10	L3	CO2
	b.	Analyze the structure of an IPV4 data gram header, particularly focusing on fields like TTL-Time to Live and Checksum. Explain each field purpose.	10	L4	CO2
Module – 4					
Q.7	a.	Explain the TCP segment structure and the significance of its key fields. Analyze how these fields are used to manage and track data segment during transmission.	10	L3	CO2
	b.	Compare and contrast UDP and TCP interms of Reliability and use cases.	10	L3	CO2
OR					
Q.8	a.	Describe the process of TCP connection establishment and termination, including the three-way handshake. Analyze the situation if one of handshake packet is lost or delayed.	10	L4	CO2
	b.	Discuss the flow control and congestion control mechanism used in TCP. Illustrate how TCP adapts to prevent packet loss also handles the data errors.	10	L3	CO2
Module – 5					
Q.9	a.	Discuss the importance of security in Application layer protocols. Explain common security measures implemented in protocol such as HTTPS, SMTPS with diagrams.	10	L2	CO3
	b.	What is Domain Name System (DNS)? Discus message structure and working mechanism with suitable diagram.	10	L2	CO2
OR					
Q.10	a.	Explain the basic model of the File – Transfer Protocol (FTP). Describe its architecture and operations.	10	L2	CO1
	b.	Discuss the architecture of electronic mail systems. Explain the roles of SMTP, POP3, and IMAP protocols.	10	L2	CO2

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026

Theory of Computation

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1				M	L	C																						
Q.1	a.	Define DFA. Design the DFA to accept each of the following languages. i) Draw a DFA to accept decimal strings divisible by 3. ii) $L = \{ W \in \{a, b\}^*, W \text{ has even number of a's and odd number of b's} \}$.		10	L2	CO1																						
	b.	Convert the following NFA to DFA <table><tr><td></td><td></td><td>0</td><td>1</td></tr><tr><td>→</td><td>p</td><td>{p, q}</td><td>{p}</td></tr><tr><td></td><td>q</td><td>{r}</td><td>{r}</td></tr><tr><td></td><td>r</td><td>{s}</td><td>ϕ</td></tr><tr><td>*</td><td>s</td><td>{s}</td><td>{s}</td></tr></table>			0	1	→	p	{p, q}	{p}		q	{r}	{r}		r	{s}	ϕ	*	s	{s}	{s}	10	L3	CO1			
		0	1																									
→	p	{p, q}	{p}																									
	q	{r}	{r}																									
	r	{s}	ϕ																									
*	s	{s}	{s}																									
OR																												
Q.2	a.	Define the following terms with an example : i) Alphabet ii) Power of an alphabet iii) String iv) Concatenation v) Languages.		10	L2	CO1																						
	b.	Consider the 6 – NFA. Compute ∈ – CLOSURE of each state and convert the automaton to DFA. <table><tr><td></td><td>∈</td><td>a</td><td>b</td><td>c</td></tr><tr><td>→</td><td>p</td><td>ϕ</td><td>{p}</td><td>{q}</td><td>{r}</td></tr><tr><td></td><td>q</td><td>{p}</td><td>{q}</td><td>{r}</td><td>ϕ</td></tr><tr><td>*</td><td>r</td><td>{q}</td><td>{r}</td><td>ϕ</td><td>{p}</td></tr></table>		∈	a	b	c	→	p	ϕ	{p}	{q}	{r}		q	{p}	{q}	{r}	ϕ	*	r	{q}	{r}	ϕ	{p}	10	L3	CO1
	∈	a	b	c																								
→	p	ϕ	{p}	{q}	{r}																							
	q	{p}	{q}	{r}	ϕ																							
*	r	{q}	{r}	ϕ	{p}																							
Module – 2																												
Q.3	a.	Define Regular expression. Obtain the RE for the following languages. i) $L = \{a^n b^m / m + n \text{ is even}\}$ ii) $L = \{w : w \bmod 3 = 0, \text{ where } w \in \{a, b\}^*\}$.		6	L2	CO2																						
	b.	Obtain the ∈ - NFA for the Regular expression : i) $(a + b)^* abb (a + bb)$ i) $ab (a + b)^* aab$.		6	L2	CO2																						
	c.	State and prove Pumping Lemma theorem for Regular Languages and prove the Language $L = \{a^n b^n / n \geq 1\}$ is not Regular language.		8	L3	CO2																						
OR																												

Q.4	a.	Minimize the following DFA using Table filling algorithm : <table><tr><td></td><td>a</td><td>b</td></tr><tr><td>$\rightarrow A$</td><td>B</td><td>F</td></tr><tr><td>B</td><td>G</td><td>C</td></tr><tr><td>* C</td><td>A</td><td>C</td></tr><tr><td>D</td><td>C</td><td>G</td></tr><tr><td>E</td><td>H</td><td>F</td></tr><tr><td>F</td><td>C</td><td>G</td></tr><tr><td>G</td><td>G</td><td>E</td></tr><tr><td>H</td><td>G</td><td>C</td></tr></table>		a	b	$\rightarrow A$	B	F	B	G	C	* C	A	C	D	C	G	E	H	F	F	C	G	G	G	E	H	G	C	8	L3	CO2
	a	b																														
$\rightarrow A$	B	F																														
B	G	C																														
* C	A	C																														
D	C	G																														
E	H	F																														
F	C	G																														
G	G	E																														
H	G	C																														
	b.	Prove that Regular Languages are closed under i) Intersection ii) Complementation.	6	L2	CO2																											
	c.	Obtain a RE for the following (Fig. Q4(c)). Finite Automation by Eliminating states. Fig. Q4(c)	6	L2	CO2																											
Module – 3																																
Q.5	a.	Define Leftmost Derivation , Rightmost Derivation and Parse tree. Construct LMD , RMD and Parse tree for the string aaabbabba using the following grammar. $S \rightarrow aB / bA$; $A \rightarrow aS / bAA / a$; $B \rightarrow bS / aBB / b$.	10	L2	CO3																											
	b.	Define Ambiguous grammar. Verify whether the grammar is ambiguous or not for the string $id * id + id$. $E \rightarrow E + E / E * E / (E) / id$	10	L2	CO3																											
OR																																
Q.6	a.	Define PDA. Design a PDA to accept the following language: $L = \{a^n b^n \mid n \geq 1\}$.	10	L2	CO3																											
	b.	Obtain the PDA for the following CFG : $S \rightarrow aABC$ $A \rightarrow aB \mid a$ $B \rightarrow bA \mid b$ $C \rightarrow a$	10	L2	CO3																											
Module – 4																																
Q.7	a.	Simplify the following CFG by eliminating useless symbols. Remove ϵ - productions and unit productions : $S \rightarrow AB / C / \epsilon$ $A \rightarrow aA / B / \epsilon$ $B \rightarrow bB / C$ $C \rightarrow c / D$ $D \rightarrow d / \epsilon$ $E \rightarrow eE$	10	L2	CO4																											

	b.	State and prove Pumping Lemma theorem for CFL's. Show that the language $L = \{ 0^n 1^n 2^n / n \geq 1 \}$ is not context free language.	10	L2	CO4
OR					
Q.8	a.	Write the Procedure for Removal of ϵ - productions. Simplify the following grammar : $S \rightarrow aA / aBB$ $A \rightarrow aAA / \epsilon$ $B \rightarrow bB / bbC$ $C \rightarrow B$	10	L3	CO4
	b.	Define CNF. Convert the following grammar to CNF [Chomsky Normal Form]. $S \rightarrow aA / bB$ $A \rightarrow aAA / bS / b$ $B \rightarrow bBB / aS / a$	10	L3	CO4
Module – 5					
Q.9	a.	Define Turing Machine (TM). Design a TM for the Language $L = \{0^n 1^n / n \geq 1\}$. Show that the string 0011 is accepted.	10	L3	CO5
	b.	Explain the following : i) Multitape Turing Machine ii) Non- deterministic Turing Machine.	10	L2	CO5
OR					
Q.10	a.	Explain the following : i) Recursively enumerable language. ii) Halting problem in TM.	10	L3	CO5
	b.	Design a TM for the Language $L = \{0^n 1^n 2^n / n \geq 1\}$. Show that the string 000111222 is accepted.	10	L2	CO5

CBCS SCHEME

BCS508

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Question Paper Version : A

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026 Environmental Studies and E-Waste Management

Time: 1 hr.

Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

-
1. An ecosystem is a region in which
 - a) Dead organism interact with environment
 - b) Living organism interact with their environment
 - c) Living organisms do not interact the environment
 - d) All of these
 2. Tendency of pollutants to become concentrated in successive trophic levels is known as
 - a) Bioremediation
 - b) Biomagnification
 - c) Biopiracy
 - d) Biorhythm
 3. Algae, green plants and photosynthetic bacteria are
 - a) Autotrophic organism
 - b) Heterotrophic
 - c) Decomposers
 - d) Consumers
 4. "The pyramid of energy is always upright" states that
 - a) The energy conversion efficiency of herbivores is better than carnivores
 - b) The energy conversion efficiency of carnivores is better than herbivores
 - c) Producers have the lowest energy conversion efficiency
 - d) Energy conversion efficiency is same in all trophic levels
 5. What is the process by which nutrients are reused in an ecosystem?
 - a) Photosynthesis
 - b) Respiration
 - c) Decomposition
 - d) Nutrient cycling
 6. What type of ecosystem is known for its unique plants adapted to water-logged condition?
 - a) Forest
 - b) Desert
 - c) Wetland
 - d) Tundra

7. Which desert ecosystem is known for its extreme heat and arid conditions?
a) Sahana b) Mojave c) Atacama d) All of these
8. What are the SDG's also known as
a) Global goals b) Millenium Development Goals
c) Sustainable Development Agend d) Agend 2030
9. What is the focus of SDG5?
a) Quality Education b) Gender Equality
c) Clean water and sanitation d) Affordable and clean energy
10. Who is the current UN secretary-General leading the SDG implementation
a) Antonio Guterres b) Ban ki-moon
c) Kofi Annan d) Javier Perez de Cuellar
11. Hydrogen fuel cells are primarily used for which application.
a) Heating homes b) Powering vehicles
c) Electricity generation in solar panels d) Water treatment
12. What is one way hydrogen can be used in the industrial sector?
a) To produce steel b) To produce biofuels
c) To generate wind energy d) To decompose plastics
13. What technology is used to convert sunlight direct into electricity?
a) Photovoltaic (PV) cells b) Solar thermal panels
c) Wind turbines d) Biomass generators
14. Which country is the largest producer of solar energy?
a) United States b) Germany
c) China d) Japan
15. Which ministry is mainly responsible for research and development in renewable energy sources such as wind power, small hydro, biogas and solar power?
a) Human Resource Development b) Agriculture and Farmers Welfare
c) Ministry of New and Renewable Energy d) Health and family Welfare
16. What is the primary cause of Eutrophication in water bodies?
a) Increased salinity
b) Excessive nutrients, particularly nitrogen and phosphorus
c) Heavy metals
d) Sedimentation
17. How can waterborne diseases be prevented?
a) Drinking unfiltered water b) Vaccination
c) Proper sanitation and hygiene d) Eating cooked food
18. Which water treatment process is most effective at killing bacteria?
a) Sedimentation b) Filtration
c) Chlorination d) Coagulation

33. What is the role of a landfill liner?
- To prevent the growth of plants
 - To trap methane gas
 - To prevent the leaching of contaminants into the ground
 - To increase landfill capacity
34. Under which rule of Government, guidelines for solid waste management are followed today?
- Municipal Solid Waste Rules, 2000
 - Municipal Solid Waste Rules, 2016
 - Solid Waste Rules, 2020
 - Solid Waste Rules, 2016
35. The average composition of Municipal solid waste is
- 41% inorganic, 40% inert and 19% recyclable
 - 41% organic, 40% inert and 19% recyclable
 - 20% organic, 60% inert and 20% recyclable
 - 30% organic, 20% inert and 50% recyclable
36. What is meant by 'waste to energy'?
- Waste that is recycled into energy
 - Waste that is incinerated to generate electricity
 - Waste that can be composted for agricultural energy use
 - Waste that is used to create biofuels
37. Under the Biomedical Waste Management Rules, 2016 biomedical waste should be treated and disposed of within how many hour generation.
- 12 hours
 - 24 hours
 - 48 hours
 - 72 hours
38. Which of the following element make e-waste hazardous in nature?
- Lead
 - Glass
 - Plastic
 - Iron
39. According to Comptroller and Auditor-General's (CAG) report what is the amount of e-waste generated annually?
- 4 LT
 - 5 LT
 - 6 LT
 - 7 LT
40. Which of the following are the main contributors of the e-waste in the world?
- Refrigerators/freezers, washing machines, dishwashers
 - Small household appliances (toasters, coffee makers, iron, hair dryers)
 - Personal computers, telephones, mobile phones, laptops, printers, scanners, photocopiers.
 - Gas cylinder, chimneys and home appliances
- Only I, II, III
 - Only I and II
 - Only I, III, IV
 - All of these
41. The highest proportion of large house hold appliances of E-waste is composed of
- Ferrous metal
 - Non-ferrous metal
 - Plastic
 - glass

42. What is extended producer responsibility as per the e-waste management rules in India?
a) The responsibility of consumers to manage e-waste
b) The responsibility of manufacturers to manage e-waste throughout the product life cycle.
c) The responsibility of retailers to manage e-waste disposal
d) The responsibility of informal recyclers to manage e-waste
43. What are the main categories of e-waste?
a) Large appliances, small appliances, IT and telecommunication equipment, consumer electronics, lighting equipment and electrical and electronic tools.
b) Glass, metal, plastic and paper
c) Food waste, organic waste and inorganic waste
d) Industrial waste, commercial waste and residential waste
44. The E-Waste (Management) Rules were revised in the year _____.
a) 2012 b) 2014 c) 2016 d) 2018
45. Which body issues guidelines for environmentally sound management of e-waste?
a) Central Pollution Control Board (CPCB)
b) Ministry of Commerce
c) National Green Tribunal
d) Bureau of Indian Standards (BIS)
46. What protective measures can reduce the health risks for workers handling e-waste
a) Wearing Personal Protective Equipments (PPE)
b) Working long hours
c) Reducing water intake
d) Increasing caffeine consumption
47. What is the primary purpose of the 'Basel Convention'?
a) To promote international trade
b) To control the transboundary movements of hazardous wastes and their disposal
c) To establish guidelines for recycling programs
d) To regulate greenhouse gas emissions
48. What is a common practice for managing e-waste in developing countries?
a) High-tech recycling facilities
b) Manual dismantling in informal sectors
c) Complete incineration
d) Export to other countries
49. The volume of nitrogen present in the troposphere is
a) 85% b) 75% c) 78% d) 99%
50. _____ are referred to as Earth's lungs
a) Forests b) Carboncycles c) Water sources d) Mines

* * * * *

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026

Artificial Intelligence

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Explain the state of art of AI.	8	L2	CO1
	b.	Evaluate different types of environment and their impact on the design of intelligent agents.	12	L5	CO1
OR					
Q.2	a.	Discuss on the types of Intelligent agents with diagram.	16	L1	CO1
	b.	Explain the concept of Rationality with an example.	4	L2	CO1
Module – 2					
Q.3	a.	Describe how a problem-solving agent approaches a well defined problem such as the vacuum cleaner.	10	L2	CO2
	b.	Given the 8-Queens problem, apply Breadth First Search (BFS) strategy to find the solution. Draft diagram to illustrate the search tree.	10	L3	CO2
OR					
Q.4	a.	Define Uninformed Search. List different types of uninformed search.	4	L2 L1	CO2
	b.	Explain any three (3) uninformed search.	16	L2 L1	CO2
Module – 3					
Q.5	a.	Fig. Q5 Find the cost using informed search methods like - Greedy Best First Search and - Simple Memory Bounded Heuristic Search (SMA*).	10	L3	CO3
	b.	Explain A* search and its optimality with given map illustration in Fig. Q5.	10	L3	CO3

OR					
Q.6		Fig. Q6 Use / Utilize the Wumpus world grid to generate propositional logic by finding the syntax, semantics, simple knowledge and inference procedure.	20	L3	CO3
Module – 4					
Q.7	a.	Apply the first order logic representation with syntax, semantics..	10	L3	CO3
	b.	Apply the first order logic representation knowledge engineering with appropriate examples.	10	L3	CO3
OR					
Q.8	a.	Differentiate Propositional logic Vs First order logic.	4	L3	CO3
	b.	Write the following sentences in first order logic and prove “John like Bread” using Forward chaining. John likes all kinds of food. Apples are Food. Chicken is Food. Anything anyone eats and isn’t killed alive Sue eats everything Bill eats Bread is Food.	16	L3	CO3
Module – 5					
Q.9	a.	Explain Backward Chaining Algorithm and prove that with an example.	10	L2	CO4
	b.	Derive a simple statement using resolution. “If it rains, the ground will be wet”	10	L4	CO4
OR					
Q.10	a.	Write notes on planning graphs in detail.	10	L2	CO5
	b.	Give an account on the algorithms for planning as state-space search.	10	L2	CO5

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026

Image and Video Processing

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C																								
Q.1	a.	Define Digital Image Processing. Explain X-Ray imaging, Gamma ray imaging and Ultra – Violet band imaging.	10	L2	CO1																								
	b.	With neat diagram, explain fundamental steps involved in digital image processing system.	10	L2	CO1																								
OR																													
Q.2	a.	Explain image sensing and acquisition using a single sensing element, sensor arrays and sensor strips.	10	L2	CO1																								
	b.	Explain image sampling and quantization and also explain representation of digital images.	10	L2	CO1																								
Module – 2																													
Q.3	a.	Explain basic intensity transformation functions such as image negatives, log transformations and power-law (gamma) transformation functions.	10	L2	CO2																								
	b.	Explain contrast stretching intensity level slicing and Bit-Plane slicing.	10	L2	CO2																								
OR																													
Q.4	a.	i) Suppose that the (continuous) intensity values in an image have the Pdf $P_r(r) = \begin{cases} \frac{2r}{(L-1)^2} & \text{for } 0 \leq r \leq L-1 \\ 0 & \text{Other wise} \end{cases}$Find $P_s(s)$. ii) Suppose a 3-bit image ($L = 8$) of size 64×64 pixels ($MN = 4096$) has the intensity distribution in Table 4(a). Plot I) Original histogram II) Transformation function III) Equalized histogram. Table 4(a) Intensity distribution and histogram values for a 3-bit, 64×64 digital image. <table><tr><th>r_k</th><th>n_k</th><th>$P_r(r_k)$</th></tr><tr><td>$r_0 = 0$</td><td>790</td><td>0.19</td></tr><tr><td>$r_1 = 1$</td><td>1023</td><td>0.25</td></tr><tr><td>$r_2 = 2$</td><td>850</td><td>0.21</td></tr><tr><td>$r_3 = 3$</td><td>656</td><td>0.16</td></tr><tr><td>$r_4 = 4$</td><td>329</td><td>0.08</td></tr><tr><td>$r_5 = 5$</td><td>245</td><td>0.06</td></tr><tr><td>$r_6 = 6$</td><td>122</td><td>0.03</td></tr><tr><td>$r_7 = 7$</td><td>81</td><td>0.02</td></tr></table> <	r_k	n_k	$P_r(r_k)$	$r_0 = 0$	790	0.19	$r_1 = 1$	1023	0.25	$r_2 = 2$	850	0.21	$r_3 = 3$	656	0.16	$r_4 = 4$	329	0.08	$r_5 = 5$	245	0.06	$r_6 = 6$	122	0.03	$r_7 = 7$	81	0.02
r_k	n_k	$P_r(r_k)$																											
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$r_4 = 4$	329	0.08																											
$r_5 = 5$	245	0.06																											
$r_6 = 6$	122	0.03																											
$r_7 = 7$	81	0.02																											

	b.	i) Obtain the Fourier transform of the rectangular pulse shown below in Fig.Q.4(b)(i) Fig.Q.4(b)(i) ii) Define convolution with relevant mathematical expressions.	10	L2	CO2
Module – 3					
Q.5	a.	Explain the model for image degradation/restoration process and different types of noise functions such as Gaussian noise, Rayleigh noise and gamma noise.	10	L2	CO3
	b.	Explain mean filters and order statistics filters used in the restoration in the presence of noise only-spatial filtering.	10	L2	CO3
OR					
Q.6	a.	Explain periodic noise reduction using frequency domain filtering with relevant expressions.	10	L2	CO3
	b.	Explain point, line and edge detection techniques with respect to image segmentation.	10	L2	CO3
Module – 4					
Q.7	a.	Define digital video processing and explain video transmission with suitable diagram.	10	L2	CO4
	b.	Explain spatiotemporal sampling structures and also explain its types.	10	L2	CO4
OR					
Q.8	a.	Explain spatiotemporal sampling structure conversion with relevant diagrams.	10	L2	CO4
	b.	Explain motion detection in detail with neat diagram.	10	L2	CO4
Module – 5					
Q.9	a.	Explain spatiotemporal noise filtering and coding artifact reduction.	10	L2	CO5
	b.	Explain Blotch detection and removal with relevant diagrams and expressions.	10	L2	CO5
OR					
Q.10	a.	Explain Vinegar syndrome removal with relevant diagram.	10	L2	CO5
	b.	Explain Kinescope moire removal and intensity flicker correction with relevant diagrams and expressions.	10	L2	CO5

CBCS SCHEME

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21CS642

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Advanced Java Programming

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is Enumerations? Explain the value() and valueOf() methods. (05 Marks)
- b. Write an illustrative program to mix different types of numeric objects in an expression. (05 Marks)
- c. Explain the following :
 - i) Type wrappers
 - ii) Auto boxing/unboxing(10 Marks)

OR

- 2 a. List and explain the built in general purposes annotations. (10 Marks)
- b. Write a java program to illustrate the annotation at Runtime by the use of reflection. (10 Marks)

Module-2

- 3 a. What are Generics? Explain a Simple Generic example. (10 Marks)
- b. Give the General form of a Generic Class? Explain. (10 Marks)

OR

- 4 a. Explain the following with example
 - i) Creating a generic method
 - ii) Generic Interfaces(10 Marks)
- b. Write a Java Program to illustrate the Generic Class Hierarchies. (10 Marks)

Module-3

- 5 a. Write a Java Program to demonstrate the use of constructors in string class. (10 Marks)
- b. Explain the character extraction methods in string class. (10 Marks)

OR

- 6 a. Explain the following :
i) String Comparison Method
ii) Modify a string (10 Marks)
- b. Write a Java Program to changing the case of characters within a string. (10 Marks)

Module-4

- 7 a. What is Servlet? Explain the different stages in Life Cycle of a servlet API's. (10 Marks)
- b. Develop a simple servlet program that handles the HTTP request and response. (10 Marks)

OR

- 8 a. Write a short notes on :
i) Session tracking
ii) Cookies (10 Marks)
- b. Write a JSP program to create with one 'username' and cookie value 'xyz'. Also display stored cookies in webpage. (10 Marks)

Module-5

- 9 a. Explain the various steps of JDBC process with code snippets. (10 Marks)
- b. List and explain the different types of database drivers in JDBC. (10 Marks)

OR

- 10 a. Write a Java Program to use the statement object to executeQuery() and executeUpdate() methods. (10 Marks)
- b. Explain the following :
i) Meta Data
ii) Reading the ResultSet. (10 Marks)

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21CS/IS644

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026

Data Science and Visualization

Time: 3 hrs.

Max. Marks: 100

Note: Answer any *FIVE* full questions, choosing *ONE* full question from each module.

Module-1

- 1 a. Interpret the hype about Data Science, Datafication and current landscape. (08 Marks)
- b. Explain the Skill Set needed for Data Scientist profile. (08 Marks)
- c. Explain the Data Scientist in terms of academia and industry. (04 Marks)

OR

- 2 a. Summarize the definition of Data Science and the components of the Conway Venn diagram. (10 Marks)
- b. Explain with example the following with respect to Data Science.
 - i) Statistical Inference
 - ii) Population
 - iii) Sample(10 Marks)

Module-2

- 3 a. Illustrate Data Science process with a neat diagram. (10 Marks)
- b. Explain the important steps carried out during Exploratory Data Analysis. (10 Marks)

OR

- 4 a. Comprehend the real direct case study and highlight the major issues addressed. (06 Marks)
- b. Explain the three primary ways to extend the linear regression beyond the least squares. (06 Marks)
- c. Explain the evaluation metric process in KNN. Given the dataset with income represented in Thousand.

Age	Income	Credit
69	3	Low
66	57	Low
49	79	Low
49	17	Low
58	26	High
44	71	High

Predict the credit rating whose age is 57 year and Income is \$37,000?

(08 Marks)

Module-3

- 5 a. Define feature generation. Explain Filter and Wrapper method feature generation algorithm and also selecting criteria in feature selection. (10 Marks)
- b. Write Decision Tree algorithm in detail. Explain Decision Tree for Chasing Dragon's problem. (10 Marks)

OR

- 6 a. Explain Bagging and Boosting in Random Forest and also importance of Hyper parameterization with example. (10 Marks)
- b. What is Dimensionality problem? Explain Singular Value Decomposition (SVD) in detail. (10 Marks)

Module-4

- 7 a. Explain the steps involved in the Data wrangling process with neat diagram. (10 Marks)
- b. Compare Line Bar and Radar Charts along with their uses and design practices with example. (10 Marks)

OR

- 8 a. What are Scatter Plots? Explain in detail Characteristics of Scatter Plots. (06 Marks)
- b. Demonstrate with a Python Code to customize the bubble plot with the following:
- i) Shape
 - ii) Edges
- (06 Marks)
- c. Discuss various Geoplots with their uses and design practices with example. (08 Marks)

Module-5

- 9 a. Describe the purpose of Matplotlib in data visualization and also create a basic line plot using Matplotlib with example. (06 Marks)
- b. Explain Legend functions with syntax and example. (06 Marks)
- c. Write Syntax for the following with respect to pyplot:
- i) Adding X Label & Y label
 - ii) Creating Figures and Format strings
 - iii) Pandas Data Frames
 - iv) Subplots
- (08 Marks)

OR

- 10 a. Develop a histogram with Specific color, edge color and line width. (06 Marks)
- b. Apply functions of stacked area chart to write a python program and demonstrate stacked area chart with suitable lable in X axis, Y-axis, title gridline (Assume data Values) (06 Marks)
- c. Explain the following with syntax and example with respect to Matplotlib :
- i) Basic Image Operations
 - ii) How to write Mathematical Expressions.
- (08 Marks)

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CBCS SCHEME

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BCS601

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026

Cloud Computing

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Explain high-performance and high throughput system with a block diagram.	10	L2	CO1
	b.	Define Virtual Machine with a neat diagram explain the 4 VM primitive operations.	10	L2	CO1
OR					
Q.2	a.	Explain the classification of parallel and distributed computing systems.	10	L2	CO1
	b.	With a neat diagram explain five thread micro architectures in modern CPU.	10	L2	CO1
Module – 2					
Q.3	a.	What is virtualization? Explain the types of virtualization with a neat diagram.	10	L2	CO2
	b.	What are physical and virtual clusters? Explain with a neat diagram and also mentioned properties of virtual clusters.	10	L2	CO2
OR					
Q.4	a.	Discuss various levels of virtualization implementation with a neat diagram.	10	L2	CO2
	b.	Write a note on : i) VM – based intrusion detection ii) Live VM migration steps.	10	L1	CO2
Module – 3					
Q.5	a.	With a neat diagram explain the types of cloud computing.	10	L2	CO3
	b.	Explain challenges in cloud architecture.	10	L2	CO3
OR					
Q.6	a.	With a neat diagram explain security aware cloud architecture.	10	L2	CO3
	b.	With a neat diagram explain six layers of cloud services.	10	L2	CO3
1 of 2					

Module – 4

Q.7	a.	With a neat diagram explain surfaces of attacks in a cloud computing environment.	10	L2	CO4
	b.	Define XoaR. Draw and explain components of XoaR.	10	L2	CO4

OR

Q.8	a.	Write a note on : i) Data integrity and privacy protection ii) Trust Overlay Networks.	10	L1	CO4
	b.	Explain with a neat diagram how data coloring and cloud watermarking is used.	10	L2	CO4

Module – 5

Q.9	a.	Explain different steps of mapreduce frameworks that are used to run user's program on a distributed computing system.	10	L2	CO5
	b.	Write application classification for parallel and distributed systems.	10	L2	CO5

OR

Q.10	a.	Explain the following terms : i) Amazon EC2 ii) Amazon S3.	10	L2	CO5
	b.	With a neat diagram explain architecture and components of Aneka.	10	L2	CO5

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026

Machine Learning

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C																																																
Q.1	a.	Define Machine Learning. Explain different types of machine learning.	10	L2	CO1																																																
	b.	Consider the following set : $S = \{12, 14, 19, 22, 24, 26, 28, 31, 32\}$. Apply various binning techniques and show the result.	6	L3	CO1																																																
	c.	Differentiate between the four types of attributes used in data analysis. Give suitable examples.	4	L2	CO1																																																
OR																																																					
Q.2	a.	Explain machine learning process model with neat diagram and list any two applications of machine learning.	10	L2	CO1																																																
	b.	Consider the set : $V = \{88, 90, 92, 94\}$. Apply min-max procedure and map the marks to a new range 0 – 1.	6	L3	CO1																																																
	c.	Explain any four data visualization techniques used for univariate data analysis.	4	L2	CO1																																																
Module – 2																																																					
Q.3	a.	Demonstrate Find-S algorithm for finding maximally specific hypothesis on the given dataset in Table 3(a). Table 3(a) <table border="1" style="margin: auto;"> <tr> <th>Origin</th><th>Manufacture</th><th>Color</th><th>Year</th><th>Type</th><th>Class</th></tr> <tr> <td>Japan</td><td>Honda</td><td>Blue</td><td>1980</td><td>Economy</td><td>Yes</td></tr> <tr> <td>Japan</td><td>Toyota</td><td>Green</td><td>1970</td><td>Sport</td><td>No</td></tr> <tr> <td>Japan</td><td>Toyota</td><td>Blue</td><td>1990</td><td>Economy</td><td>Yes</td></tr> <tr> <td>USA</td><td>Audi</td><td>Red</td><td>1980</td><td>Economy</td><td>No</td></tr> <tr> <td>Japan</td><td>Honda</td><td>White</td><td>1980</td><td>Economy</td><td>Yes</td></tr> <tr> <td>Japan</td><td>Toyota</td><td>Green</td><td>1980</td><td>Economy</td><td>Yes</td></tr> <tr> <td>Japan</td><td>Honda</td><td>Red</td><td>1980</td><td>Economy</td><td>No</td></tr> </table>	Origin	Manufacture	Color	Year	Type	Class	Japan	Honda	Blue	1980	Economy	Yes	Japan	Toyota	Green	1970	Sport	No	Japan	Toyota	Blue	1990	Economy	Yes	USA	Audi	Red	1980	Economy	No	Japan	Honda	White	1980	Economy	Yes	Japan	Toyota	Green	1980	Economy	Yes	Japan	Honda	Red	1980	Economy	No	10	L3	CO2
Origin	Manufacture	Color	Year	Type	Class																																																
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Japan	Honda	Red	1980	Economy	No																																																
	b.	Write steps involved in PCA (Principal Component Analysis) algorithm.	5	L2	CO2																																																
	c.	Explain any five metrics used to evaluate the performance of machine learning model.	5	L2	CO2																																																
1 of 3																																																					

OR

Q.4	a.	Apply Candidate Elimination Algorithm (CEA) on the following dataset in Table 4(a) and determine the final version space. Table 4(a)	10	L3	CO2																																								
		<table><tr><td>Sl. No. Example</td><td>Sky</td><td>Air Temp</td><td>Humidity</td><td>Wind</td><td>Water</td><td>Forecast</td><td>Enjoy sport</td></tr><tr><td>1</td><td>Sunny</td><td>Warm</td><td>Normal</td><td>Strong</td><td>Warm</td><td>Same</td><td>Yes</td></tr><tr><td>2</td><td>Sunny</td><td>Warm</td><td>High</td><td>Strong</td><td>Warm</td><td>Same</td><td>Yes</td></tr><tr><td>3</td><td>Rainy</td><td>Cold</td><td>High</td><td>Strong</td><td>Warm</td><td>Change</td><td>No</td></tr><tr><td>4</td><td>Sunny</td><td>Warm</td><td>High</td><td>Strong</td><td>Cool</td><td>Change</td><td>Yes</td></tr></table>				Sl. No. Example	Sky	Air Temp	Humidity	Wind	Water	Forecast	Enjoy sport	1	Sunny	Warm	Normal	Strong	Warm	Same	Yes	2	Sunny	Warm	High	Strong	Warm	Same	Yes	3	Rainy	Cold	High	Strong	Warm	Change	No	4	Sunny	Warm	High	Strong	Cool	Change	Yes
	Sl. No. Example	Sky				Air Temp	Humidity	Wind	Water	Forecast	Enjoy sport																																		
	1	Sunny				Warm	Normal	Strong	Warm	Same	Yes																																		
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3	Rainy	Cold	High	Strong	Warm	Change	No																																						
4	Sunny	Warm	High	Strong	Cool	Change	Yes																																						
b.	Explain Bivariate Statistics. Describe covariance and correlation with formulas and interpretation.	5	L2	CO2																																									
c.	Explain Re-sampling methods for model evaluation.	5	L2	CO2																																									

Module – 3

Q.5	a.	Using the K-Nearest Neighbors (KNN) algorithm with K = 3 and Euclidean distance, classify the result of student having (CGPA = 6.1, Assessment = 40, Project submitted = 5) based on dataset in Table 5(a). Table 5(a)	10	L3	CO3																																												
	<table><tr><th>Sl. No.</th><th>CGPA</th><th>Assessment</th><th>Project Submitted</th><th>Result</th></tr><tr><td>1</td><td>9.2</td><td>85</td><td>8</td><td>Pass</td></tr><tr><td>2</td><td>8</td><td>80</td><td>7</td><td>Pass</td></tr><tr><td>3</td><td>8.5</td><td>81</td><td>8</td><td>Pass</td></tr><tr><td>4</td><td>6</td><td>45</td><td>5</td><td>Fail</td></tr><tr><td>5</td><td>6.5</td><td>50</td><td>4</td><td>Fail</td></tr><tr><td>6</td><td>8.2</td><td>72</td><td>7</td><td>Pass</td></tr><tr><td>7</td><td>5.8</td><td>38</td><td>5</td><td>Fail</td></tr><tr><td>8</td><td>8.9</td><td>91</td><td>9</td><td>Pass</td></tr></table>		Sl. No.	CGPA	Assessment	Project Submitted	Result	1	9.2	85	8	Pass	2	8	80	7	Pass	3	8.5	81	8	Pass	4	6	45	5	Fail	5	6.5	50	4	Fail	6	8.2	72	7	Pass	7	5.8	38	5	Fail	8	8.9	91	9	Pass		
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4	6	45	5	Fail																																													
5	6.5	50	4	Fail																																													
6	8.2	72	7	Pass																																													
7	5.8	38	5	Fail																																													
8	8.9	91	9	Pass																																													
	b.	List and explain different types of regression methods used in machine learning.	4	L2	CO3																																												
	c.	Explain the procedure to construct a decision tree using ID ₃ algorithm.	6	L2	CO3																																												

OR

Q.6	a.	Explain nearest centroid classifier and classify test instance (6, 5) using dataset in Table 6(a). Show all steps involved. Table 6(a)<table><tr><td>X</td><td>Y</td><td>Class</td></tr><tr><td>3</td><td>1</td><td>A</td></tr><tr><td>5</td><td>2</td><td>A</td></tr><tr><td>4</td><td>3</td><td>A</td></tr><tr><td>7</td><td>6</td><td>B</td></tr><tr><td>6</td><td>7</td><td>B</td></tr><tr><td>8</td><td>5</td><td>B</td></tr></table>	X	Y	Class	3	1	A	5	2	A	4	3	A	7	6	B	6	7	B	8	5	B	10	L3	CO3
X	Y	Class																								
3	1	A																								
5	2	A																								
4	3	A																								
7	6	B																								
6	7	B																								
8	5	B																								

	b.	Explain concept of logistic regression with its mathematical model and application.	4	L2	CO3
	c.	Explain how the C4.5 algorithm constructs a decision tree for dataset with discrete valued attributes.	6	L2	CO3
Module – 4					
Q.7	a.	Explain Naive Bayes algorithm. Mention its applications and limitation.	10	L3	CO4
	b.	Explain simple model of an artificial neuron and the structure of an Artificial Neural Network (ANN). Also describe any four activation functions.	10	L2	CO4
OR					
Q.8	a.	With a diagram of the Perceptron Model, explain the perceptron learning algorithm.	10	L3	CO4
	b.	Explain different types of Artificial Neural Network (ANNs) and list the major challenges associated with ANN.	10	L2	CO4
Module – 5					
Q.9	a.	Explain different hierarchical clustering algorithms and describe linkage criteria used.	10	L3	CO5
	b.	Explain density based clustering with DBSCAN. Mention its advantages.	10	L2	CO5
OR					
Q.10	a.	Explain Reinforcement Learning (RL), its characteristics and challenges.	10	L2	CO5
	b.	Explain the Q-learning algorithm with its steps and formulas.	10	L2	CO5

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BCS613D

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026

Advanced Java

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1				M	L	C
Q.1	a.	What is collection framework? Explain the methods defined by collection interface.	8	L1	CO1	
	b.	Explain accessing collection via an Iterator and random access interface.	7	L2	CO1	
	c.	Discuss user defined classes in collection.	5	L1	CO1	
OR						
Q.2	a.	Elaborate the concepts of maps and comparators in Java.	8	L2	CO1	
	b.	Discuss various collection algorithms.	6	L1	CO1	
	c.	What is an Interface? Explain various legacy classes.	6	L1	CO1	
Module – 2						
Q.3	a.	With a program explain string constructors.	8	L1	CO2	
	b.	Write a program to demonstrate string buffer and string builder.	8	L2	CO2	
	c.	Discuss string comparison methods with examples.	4	L1	CO2	
OR						
Q.4	a.	Write a program to demonstrate various string operations.	8	L2	CO2	
	b.	Explain data conversion using valueOf() and write a program for changing case of characters in a string.	8	L2	CO2	
	c.	Discuss character extraction methods in string.	4	L1	CO2	
Module – 3						
Q.5	a.	What is Swing? Explain two key swing features.	7	L1	CO3	
	b.	Elaborate the concept of MVC connection in swings.	3	L2	CO3	
	c.	Explain components, containers and swing packages.	10	L1	CO3	

OR

Q.6	a.	Discuss event handling and painting in swing.	8	L1	CO3
	b.	Explain the following: i) JLabel and Image Icon ii) JTextField iii) JToggleButton iv) Radio Buttons	12	L1	CO3

Module – 4

Q.7	a.	What is Servlet? Explain servlet life cycle.	7	L1	CO4
	b.	Discuss the importance of servlet API. Explain servlet packages.	7	L1	CO4
	c.	With a program, demonstrate reading servlet parameters.	6	L2	CO4

OR

Q.8	a.	Write a program for handling HTTP requests and responses.	7	L2	CO4
	b.	Explain various JSP tags.	8	L1	CO4
	c.	Discuss user sessions and cookies in servlet.	5	L1	CO4

Module – 5

Q.9	a.	Why we use JDBC? Explain various steps of JDBC process.	10	L1	CO5
	b.	Explain JDBC packages and statement objects.	10	L1	CO5

OR

Q.10	a.	With a diagram, explain JDBC driver types.	10	L1	CO5
	b.	Explain the following concepts in JDBC: i) Transaction processing ii) Result set and metadata iii) Data types	10	L1	CO5

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BCS654A/BIS654A

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Introduction to Data Structures

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	What is an array? Explain how one-dimensional and two-dimensional arrays are declared, initialized and accessed with examples.	10	L2	CO1
	b.	What is a pointer? Explain how pointers are declared, assigned and accessed with examples. Write a C program to display array elements using arrays.	10	L1 L2	CO1
OR					
Q.2	a.	What are NULL and Dangling pointers.	4	L1	CO1
	b.	Explain different dynamic memory allocation methods with examples.	8	L2	CO1
	c.	What is structure? Explain how structures are defined with example.	8	L1 L2	CO1
Module – 2					
Q.3	a.	What is a stack? Write a C function to perform various stack operations.	10	L1 L2	CO2
	b.	Define a queue. List the different types of queues. Describe the various operations on ordinary queue.	10	L1 L2	CO2
OR					
Q.4	a.	What is circular queue? Write C code to implement the following operations in a circular queue : (i) Insert (ii) Delete (iii) Display	10	L1 L2	CO2
	b.	What is double ended queue? Explain with example.	6	L1 L2	CO2
	c.	List the different applications of queue.	4	L1	CO2
Module – 3					
Q.5	a.	What is Linked list? What are the different types of linked list? Explain.	8	L2	CO3
	b.	Write a C function to implement the following operations with respect to singly linked list : (i) Insert a node at the beginning. (ii) Delete a node from the beginning. (iii) Display	12	L2 L3	CO3

OR					
Q.6	a.	List the difference between static memory allocation and linked allocation.	8	L2	CO3
	b.	What is circular linked list? Write a C function to implement the following with respect to circular linked list : (i) Insert a node at the beginning. (ii) Insert a node at the end (iii) Display	12	L2 L3	CO3
Module – 4					
Q.7	a.	What is Binary Tree? Explain the different representations of binary trees in memory with examples.	8	L2	CO4
	b.	Describe the various types of tree traversals of binary tree. Write a C function for Inorder, Preorder and Postorder traversals and illustrate them with an example binary tree.	12	L3	CO4
OR					
Q.8	a.	Explain the different types of binary tree with examples.	10	L2	CO4
	b.	Define a Binary search tree. Explain the following operations on a binary search tree with examples : i) Finding maximum values ii) Finding minimum value iii) Counting nodes	10	L2	CO4
Module – 5					
Q.9	a.	What is sorting? Write a C program to arrange the numbers in ascending order using Bubble sort.	10	L2 L3	CO5
	b.	Describe the selection sort technique. Illustrate the sorting of an array [23, 16, 67, 39, 45, 33, 94, 11] using selection sort.	10	L3	CO5
OR					
Q.10	a.	What is Linear Search? Write a C program to implement the linear search method.	10	L3	CO5
	b.	What are the advantages and disadvantages of Binary Search method? Explain the working of Binary Search method with example.	10	L3	CO5

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BCS/BIS654B

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Fundamentals of Operating Systems

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C										
Q.1	a.	What is Operating System? Explain with neat diagram the components of computer system.	10	L2	CO1										
	b.	Explain the operating system operations.	10	L2	CO1										
OR															
Q.2	a.	Explain the services provided by the operating system.	10	L2	CO1										
	b.	What are system calls? Explain the different types of system calls.	10	L2	CO1										
Module – 2															
Q.3	a.	Define Process. Explain process state diagram and process control block.	10	L2	CO1										
	b.	Define IPC. Explain message passing and shared memory with neat diagram.	10	L2	CO1										
OR															
Q.4	a.	Explain the operations on processes.	10	L2	CO2										
	b.	Mention and explain different multithreading models.	10	L2	CO2										
Module – 3															
Q.5	a.	What is Scheduling? Explain the scheduling criteria.	10	L2	CO2										
	b.	Consider the following set of processes, with the length of CPU burst given in milliseconds. <table border="1"><tr><td>Process</td><td>Burst Time</td></tr><tr><td>P₁</td><td>6</td></tr><tr><td>P₂</td><td>8</td></tr><tr><td>P₃</td><td>7</td></tr><tr><td>P₄</td><td>3</td></tr></table> Draw Gantt chart and calculate average waiting time for FCFS and SJF.	Process	Burst Time	P ₁	6	P ₂	8	P ₃	7	P ₄	3	10	L3	CO2
Process	Burst Time														
P ₁	6														
P ₂	8														
P ₃	7														
P ₄	3														
1 of 2															

OR

Q.6	a.	What is critical section problem? What are its requirements? Explain Peterson's solution for critical section.	10	L2	CO2
	b.	Define semaphore. Explain its usage and implementation.	10	L2	CO2

Module – 4

Q.7	a.	Define Deadlock. What are the necessary conditions for deadlock to occur? Describe the resource allocation graph.	10	L2	CO3
	b.	Explain the Deadlock prevention in detail.	10	L2	CO3

OR

Q.8	a.	What is Paging? Explain with neat diagram paging hardware with TLB.	10	L2	CO3
	b.	Explain the contiguous memory allocation with neat diagram.	10	L2	CO3

Module – 5

Q.9	a.	Explain the steps in handling a page fault with neat diagram.	10	L2	CO3
	b.	Explain page replacement algorithms with example.	10	L2	CO3

OR

Q.10	a.	What is File? What are its attributes? What are the file operations?	10	L2	CO3
	b.	Explain the different file access methods.	10	L2	CO3

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21CS71

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Big Data Analytics

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Define Big data. Describe characteristics and types of Big Data.	10	L2	CO1
	b.	What is Web data? Explain how do you classify data as structured, semistructured, multistructured and unstructured data? Give suitable examples.	10	L2	CO1
OR					
Q.2	a.	With a neat diagram, explain the function of each of the five layers in big data architecture design.	10	L2	CO1
	b.	Write short notes on Analytics scalability to Big data and Massive Parallel processing platforms.	10	L2	CO1
Module – 2					
Q.3	a.	With a neat diagram, explain Hadoop main components and ecosystem components.	10	L2	CO2
	b.	Brief out the features of Hadoop and explain HDFS commands with example.	10	L2	CO2
OR					
Q.4	a.	Explain in detail about Hadoop MapReduce-Frame work with programming model.	10	L2	CO2
	b.	Describe Hadoop YARN and YARN Based Execution Model.	10	L2	CO2
Module – 3					
Q.5	a.	Discuss NoSQL data architecture pattern with an example.	10	L2	CO3
	b.	Compare and contrast RDBMS and Mongo DB databases.	5	L2	CO3
	c.	What are the different ways of handling Big data problems?	5	L2	CO3
OR					
Q.6	a.	Discuss the usage of Apache 'S' HBase, MongoDB, Cassandra and Apache 'S' CouchDB.	8	L2	CO3

	b.	With neat diagram, explain the following Shared-Nothing Architecture for Big data tasks : (i) Single server Model (ii) Sharding very large database. (iii) Master Slave distribution Model. (iv) Peer-to-peer distribution Model.	12	L2	CO3
Module – 4					
Q.7	a.	Describe MapReduce execution steps with a neat sketch.	10	L2	CO4
	b.	Define HIVE. List out characteristics and explain Hive architecture in detail.	10	L2	CO4
OR					
Q.8	a.	Demonstrate the pig architecture for scripts data flow and processing.	10	L2	CO4
	b.	Explain with respect to HIVE QL : (i) HIVE QL Data Definition Language (DDL) (ii) HIVE QL Data Manipulation Language (DML)	10	L3	CO4
Module – 5					
Q.9	a.	Explain with an example, Apriori algorithm to evaluate candidate key.	10	L3	CO5
	b.	What are Outliers? Describe the reasons for the presence of outliers in a relationship.	5	L2	CO5
	c.	In Machine Learning explain ANOVA.	5	L2	CO5
OR					
Q.10	a.	Discuss the different phases of text mining process.	10	L2	CO5
	b.	Briefly explain process of Web Usage Mining.	10	L2	CO5

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21CS72

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Cloud Computing

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is Cloud Computing? Explain cloud computing reference model. (10 Marks)
- b. Explain in brief the services provided by the following cloud service providers
i) Amazon web services
ii) Manjrasoft Aneka. (10 Marks)

OR

- 2 a. What s Virtuliazation? Explain the characteristics of virtulization. (10 Marks)
- b. Explain with neat diagram, Type – I and Type – II hypervisor. (10 Marks)

Module-2

- 3 a. Explain in detail cloud computing architecture. (10 Marks)
- b. Explain cloud reference model with neat diagram. (10 Marks)

OR

- 4 a. Explain laas. Explain its reference implementation with neat diagram. (10 Marks)
- b. Explain with neat diagram, logical organization of the Aneka cloud. (10 Marks)

Module-3

- 5 a. Explain security risks in cloud computing and also explain the importance of a Privacy Impact Assessment (PIA) in cloud environments. (10 Marks)
- b. Explain the role of trust in cloud computing between providers and users. (05 Marks)
- c. What are the key security concerns related to Virtual Machines (VMS) in the cloud. (05 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

- 6 a. Explain the security challenges related to the Operating System (OS) in cloud infrastructure. (10 Marks)
- b. Explain the security risks posed by shared images and management OS in cloud environments. (10 Marks)

Module-4

- 7 a. Describe the compute services offered by AWS and their importance in cloud computing. (10 Marks)
- b. What are AWS storage services, and explain how do they ensure data availability. (10 Marks)

OR

- 8 a. Explain Google Map-reduce infrastructure in detail. (10 Marks)
- b. Explain Big table architecture. (10 Marks)

Module-5

- 9 a. Explain about the storage services of cloud platforms. (10 Marks)
- b. Explain the Google AppEngine platform Architecture in detail. (10 Marks)

OR

- 10 a. Explain ECG analysis in cloud. (10 Marks)
- b. Discuss applications of cloud computing in satellite image processing. (10 Marks)

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21CS735

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Internet of Things

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is IoT? Differentiate between IoT and M2M & IoT and WoT. (10 Marks)
- b. Explain the evolution of IoT with diagram and example. (10 Marks)

OR

- 2 a. How is node mobility handled in IoT Network? (10 Marks)
- b. Explain the Addressing strategies in IoT. (10 Marks)

Module-2

- 3 a. Define Sensor, explain the functional blocks of a typical sensor node in IoT. (10 Marks)
- b. List and explain different types of sensing and provide an example for each. (10 Marks)

OR

- 4 a. What is an Actuator? Explain the different types of actuators with an example for each. (10 Marks)
- b. Differentiate between Sensors and Actuators. (10 Marks)

Module-3

- 5 a. What are the different data formats found in IoT network traffic streams? (10 Marks)
- b. Define processing offloading with block diagram and explain any one data offloading. (10 Marks)

OR

- 6 a. Explain the pros and cons of on-site and off-site processing. (10 Marks)
- b. Explain the IoT Device Design and Selection Considerations. (10 Marks)

Module-4

- 7 a. Explain the protocol stack of IEEE 802.15.4. (10 Marks)
- b. Elaborate on the various network topologies of Zigbee and explain the protocol stack of Zigbee. (10 Marks)

OR

- 8 a. Differentiate between Class 1, 2 and 3 Bluetooth devices. (10 Marks)
- b. Explain the Z-wave protocol stack. (10 Marks)

Module-5

- 9 a. Explain IPV6 format. (10 Marks)
- b. Explain the Websockets in a stack. (10 Marks)

OR

- 10 a. Describe the following standards : (10 Marks)
- i) EnOcean
 - ii) DLNA
- b. How is X-10 different from DLNA? (10 Marks)

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21CS741

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Software Architecture and Design Patterns

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain the essential elements of design patterns. (10 Marks)
- b. Illustrate the differences between design patterns and frameworks with examples. (10 Marks)

OR

- 2 a. Identify the importance of conceptual classes and their relationships in object oriented design. (10 Marks)
- b. Explain a sequence diagram with suitable example, highlighting key components and interactions. (10 Marks)

Module-2

- 3 a. With a neat diagram, explain the structure of the proxy pattern. (10 Marks)
- b. Describe the structure of the composite pattern. (10 Marks)

OR

- 4 a. Analyze the motivation and applicability of the decorator pattern. (10 Marks)
- b. Define part-whole hierarchies and explain with an example. (10 Marks)

Module-3

- 5 a. Explain how the chain of responsibility patterns decouples senders and receivers. Illustrate with an example. (10 Marks)
- b. Discuss the benefits and liabilities of the chain of responsibility pattern. (10 Marks)

OR

- 6 a. Explain how the iterator can support multiple traversals of an aggregate. (10 Marks)
- b. Discuss the implementation challenges at the iterator pattern. (10 Marks)

Module-4

- 7 a. Describe the roles of the view and controller in the MVC pattern. (10 Marks)
- b. Explain how MVC achieves separation of concerns in software design. (10 Marks)

OR

- 8 a. Explain how the bridge pattern is used to handle multiple UI technologies in MVC. (10 Marks)
- b. Create a sequence diagram for saving and retrieving a drawing in an MVC-based application. (10 Marks)

Module-5

- 9 a. Explain the challenges of accessing remote objects in distributed systems. (10 Marks)
- b. Describe the role of proxies in handling remote method calls in distributed systems. (10 Marks)

OR

- 10 a. Explain the role of HTML in web based distributed systems. (10 Marks)
- b. Describe the use of Apache Tomcat for hosting servlets in a distributed system. (10 Marks)

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21CS752

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Introduction to AI and ML

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is Artificial Intelligence? List and explain foundations of Artificial Intelligence. (10 Marks)
- b. Explain the following:
 - i) Turing Test Approach
 - ii) Cognitive Model Approach
 - iii) Laws of Thought Approach
 - iv) Rational Agent Approach
 (10 Marks)

OR

- 2 a. Demonstrate with a neat diagram how agents interact with environments through sensors and actuators. (05 Marks)
- b. Discuss about nature of environment with an example. (07 Marks)
- c. Explain structure of the agents and its types. (08 Marks)

Module-2

- 3 a. List and explain the phases of problem-solving process and well defined problems and solutions. (08 Marks)
- b. Discuss the Breadth first search and depth first search algorithm with an example. (12 Marks)

OR

- 4 a. Discuss about heuristic function of greedy best first search. Apply GBFS to find out the most cost effective path from state A to goal state G. (10 Marks)

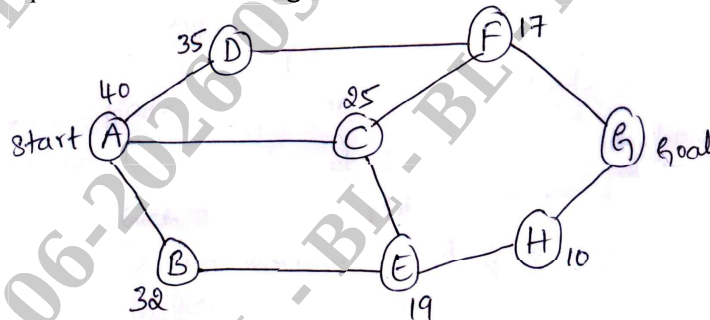


Fig.Q.4(a)

- b. Apply A* algorithm to find out the most cost effective path from start state A to goal state G. (10 Marks)

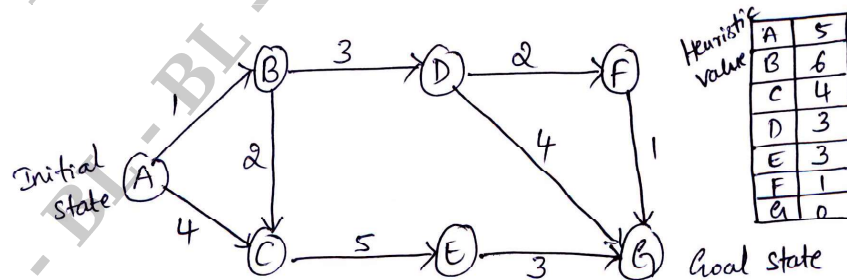


Fig.Q.4(b)

Module-3

- 5 a. Define Machine Learning. Summarize how machine learning is linked to AI, data science and statistics. (07 Marks)
 b. Discuss the types of machine learning with examples. (08 Marks)
 c. Explain the Machine Learning Process Model. (05 Marks)

OR

- 6 a. Define Data. Discuss the types of data and data storage and representation of data. (07 Marks)
 b. Describe Big data analytics and types of analytics in detail. (06 Marks)
 c. Explain the Big data analysis framework. (07 Marks)

Module-4

- 7 a. What is Bivariate and Multivariate? Discuss Bivariate and Multivariate statistics with examples. (10 Marks)
 b. Define Probability Distributions. Explain the types of probability distributions. (10 Marks)

OR

- 8 a. Write find-s algorithm. Apply the find-s algorithm for the training dataset of 4 instances as shown below, which contains the details of the performance of students and their likelihood of getting a job offer or not in their final semester.

CGPA	Interactiveness	Practical knowledge	Communication skills	Logical thinking	Interest	Job offer
≥ 9	Yes	Excellent	Good	Fast	Yes	Yes
≥ 9	Yes	Good	Good	Fast	Yes	Yes
≥ 8	No	Good	Good	Fast	No	No
≥ 9	Yes	Good	Good	Slow	No	Yes

(10 Marks)

- b. Differentiate between instance-based learning and model-based learning. (05 Marks)
 c. Explain K-nearest neighbor learning algorithm. (05 Marks)

Module-5

- 9 a. Explain the structure of an ANN with a neat diagram. Discuss about the types of ANN. (10 Marks)
 b. Write a short note on Perceptron Model. (05 Marks)
 c. Write Perceptron Algorithm. (05 Marks)

OR

- 10 a. Discuss a learning in a multi-layer perceptron algorithm with forward and backward propagation. (10 Marks)
 b. Explain radial basis function neural network. (10 Marks)

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BCS701

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Internet of Things

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	What are the characteristics of IoT and application of IoT?	10	L1	CO1
	b.	Summarize the IoT Protocols.	10	L2	CO1
OR					
Q.2	a.	Describe the functional blocks of an IoT system and communication model.	10	L2	CO1
	b.	Discuss a Level – 6 IoT systems for weather monitoring with diagram.	10	L2	CO1
Module – 2					
Q.3	a.	Outline the End – to – End Architecture for M2M systems with diagram.	10	L2	CO2
	b.	What is NFV (Network Function Virtualization)? How NFV can be used to Virtualized the Home Gateway.	10	L2	CO2
OR					
Q.4	a.	What is the need for IoT System Management?	10	L1	CO2
	b.	Explain the Generic approach for IoT device management with NETCONF-YANG.	10	L2	CO2
Module – 3					
Q.5	a.	What are the steps involved in IoT system design methodology?	10	L1	CO3
	b.	Explain the Information model for the weather monitoring IoT system.	10	L2	CO3
OR					
Q.6	a.	Explain the characteristics of Lists, Tuples, Dictionaries and sets with suitable examples.	10	L2	CO3
	b.	Differentiate between Operator overloading and Function overriding with examples.	10	L2	CO3
Module – 4					
Q.7	a.	Explain the basic building blocks of an IoT device.	10	L2	CO4
	b.	List and explain the Raspberry Pi frequently used commands.	10	L2	CO4
OR					

Q.8	a.	Discuss the benefits of using cloud based system for Data collection and Analysis in a smart irrigation setup.	10	L2	CO4
	b.	Describe the deployment design of the Home Automation IoT system.	10	L2	CO4
Module – 5					
Q.9	a.	Explain the MapReduce job execution workflow for Hadoop MapReduce frame work with diagram.	10	L2	CO5
	b.	Explain a Hadoop MapReduce workflow for batch analysis of IoT data with diagram.	10	L2	CO5
OR					
Q.10	a.	Explain Hadoop YARN job execution with a diagram.	10	L2	CO5
	b.	Write a short note on Apache Oozie , Apache Spark and Apache Storm.	10	L1	CO5

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BCS702

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Parallel Computing

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Define parallel computing. Why we need ever increasing performance? Explain with an example.	10	L2	CO1
	b.	Briefly explain SIMD system.	10	L2	CO1
OR					
Q.2	a.	Explain the two main types of MIMD systems.	10	L2	CO1
	b.	What is cache coherence? Explain two main approaches to insuring cache coherence.	10	L2	CO1
Module – 2					
Q.3	a.	Write a note on speed up and efficiency in MIMD systems.	10	L2	CO2
	b.	What is the need of Amdahl's law? Explain the Amdahl's law.	10	L2	CO2
OR					
Q.4	a.	Briefly explain scalability in MIMD systems. Explain GPU performance.	10	L2	CO2
	b.	Explain with an example for taking timings of MIMD programs.	10	L2	CO2
Module – 3					
Q.5	a.	List and explain MPI-functions with an example.	10	L2	CO3
	b.	Illustrate the trapezoidal rule in MPI with the pseudocode.	10	L2	CO3
OR					
Q.6	a.	Briefly explain MPI derived data types with an example.	10	L2	CO3
	b.	Briefly explain collective communication and also differentiate between collective communication and point to point communication.	10	L2	CO3
Module – 4					
Q.7	a.	Explain Reduction Clause in OpenMP.	10	L2	CO4
	b.	Explain scheduling loops in OpenMP.	10	L2	CO4

OR					
Q.8	a.	Discuss parallel for directives in detail.	08	L2	CO4
	b.	Explain the concept of producer consumer problem using OpenMP. Give functions to explain the message passing using OpenMP.	12	L2	CO4
Module – 5					
Q.9	a.	Write a note on GPU architecture and also differentiate between GPU's and GPGPU's.	10	L2	CO5
	b.	Explain Threads, blocks and grids Nvidia compute capabilities and device architecture.	10	L2	CO5
OR					
Q.10	a.	Illustrate cuda trapezoidal rule-I with suitable example.	10	L2	CO5
	b.	State Cuda trapezoidal rule-II and explain briefly along with improving performance.	10	L2	CO5

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Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Cryptography and Network Security

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	What is Cryptography? Explain a model for Network Security.	6	L1	CO1
	b.	Explain Monoalphabetic Cipher with Caesar Cipher.	6	L2	CO2
	c.	Explain Playfair Cipher and encrypt 'QUESTION' with the key = 'ANSWER' based on playfair cipher.	8	L3	CO2
OR					
Q.2	a.	Explain stream ciphers and block ciphers with neat diagram.	6	L1	CO1
	b.	Discuss the strength of DES.	6	L2	CO2
	c.	Encrypt the message "X HOW ARE YOU" based on hill Cipher with the key $K = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$.	8	L3	CO2
Module – 2					
Q.3	a.	Write a model of public key cryptosystem used for secrecy.	6	L1	CO2
	b.	Perform encryption and decryption using the RSA algorithm for the $p = 5, q = 13, e = 5, M = 8$.	8	L3	CO2
	c.	Write an algorithm for Diffie-Hellman key exchange.	6	L2	CO2
OR					
Q.4	a.	Alice and Bob use the diffie-Hellman key exchange technique with a common prime $q = 157$ and a primitive root $\alpha = 5$. i) If Alice has a private key $X_A = 15$, find her public key Y_A . ii) If Bob has a private key $X_B = 27$, find his public key Y_B . iii) What is the shared secret key between Alice and Bob.	10	L3	CO2
	b.	For $E_{11}(1,7)$, consider the point $G = (3, 2)$. Compute $2G$ and $3G$.	10	L3	CO2
Module – 3					
Q.5	a.	Explain symmetric key distribution using public keys.	10	L2	CO4
	b.	Discuss different types of distribution of public keys.	10	L2	CO4

OR					
Q.6	a.	Explain X.509 certificate along with the format.	10	L2	CO4
	b.	Explain essential components of public key infrastructure.	10	L2	CO4
Module – 4					
Q.7	a.	Give the scenario of mutual authentication with respect to remote user authentication using symmetric encryption.	10	L2	CO3
	b.	What is Kerberos? Give the summary of Kerberos version 4 message exchanger.	10	L2	CO3
OR					
Q.8	a.	Compare different threats on the web with respect to threats, consequences and countermeasures.	10	L2	CO3
	b.	Explain different S/MIME services.	10	L2	CO3
Module – 5					
Q.9	a.	Explain DKIM deployment with example.	10	L2	CO5
	b.	Explain applications and benefits of IP security.	10	L2	CO5
OR					
Q.10	a.	Differentiate transport mode and tunnel modes.	5	L2	CO5
	b.	Explain processing model for outbound packets.	10	L2	CO5
	c.	Write top level format of an ESP packet.	5	L2	CO5

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BCS714D

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Big Data Analytics

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	What are the characteristics of data? Define big data and explain evolution of big data.	10	L2	CO1
	b.	Explain the techniques for dealing with unstructured data.	10	L2	CO1
OR					
Q.2	a.	Explain CAP Theorem. List the advantages of NoSQL.	10	L2	CO1
	b.	Examine the growth of analytics and compare Analytics 1.0, 2.0, 3.0.	10	L2	CO1
Module – 2					
Q.3	a.	Explain Hadoop Components. Why hadoop is a popular technology.	10	L2	CO2
	b.	Give the hdfs commands to perform the following operations : i) To get the list of directories and files at the root HDFS ii) To create a directory (say sample) in HDFS iii) To copy a file from local file system to HDFS iv) To display the contents of an HDFS file on console v) To remove a directory from HDFS	10	L3	CO2
OR					
Q.4	a.	Describe the daemons what are part of YARN architecture.	10	L2	CO2
	b.	Discuss the anatomy of file write operations in HDFS with a diagram.	10	L3	CO2
Module – 3					
Q.5	a.	What is MongoDB. Explain the following with regard to MongoDB. Creating or generating a unique key : i) Database ii) Collection iii) Document	10	L2	CO3
	b.	Examine MongoDB import and MongoDB export commands.	10	L4	CO3

OR					
Q.6	a.	Explain the process of replication and sharding in MongoDB.	10	L2	CO3
	b.	Compare how insert, delete and update statement are written in RDBMS and MongoDB.	10	L4	CO3
Module – 4					
Q.7	a.	Explain different Hive file formats.	10	L2	CO3
	b.	Identify and explain Hive features and Hive Data Units.	10	L3	CO3
OR					
Q.8	a.	What is Pig? What are its features? Explain is Pig Philosophy.	10	L2	CO3
	b.	Demonstrate following relational operators in Pig, with example : Filter, ForEach, GroupBy.	10	L3	CO3
Module – 5					
Q.9	a.	Explain the features of spark.	10	L2	CO3
	b.	Discuss Spark Software Stack.	10	L2	CO3
OR					
Q.10	a.	Define Web Data. What are the features of Web Data.	10	L2	CO4
	b.	Discuss text mining challenges.	10	L2	CO4

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BCS755C

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Software Engineering

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Define Software Engineering and explain practices involved in software engineering.	6	L2	CO1
	b.	Demonstrate spiral model with a neat diagram.	6	L2	CO1
	c.	Define process and explain generic process framework.	8	L2	CO1
OR					
Q.2	a.	Demonstrate V-model with a neat labeled diagram.	8	L2	CO1
	b.	List and explain software application domain.	8	L2	CO1
	c.	Explain unique nature of Web Apps.	4	L2	CO1
Module – 2					
Q.3	a.	Explain scenario based model with example.	10	L2	CO2
	b.	Explain key steps involved in establishing the fundamental groundwork for a successful Software Engineering project.	10	L2	CO2
OR					
Q.4	a.	Explain Negotiating Requirement and Validating Requirement in detail.	10	L2	CO2
	b.	Briefly explain Data Modeling concepts in detail.	10	L2	CO2
Module – 3					
Q.5	a.	Demonstrate Extreme programming process with neat diagram.	10	L2	CO3
	b.	What is Agility? Explain the principles of Agile Software development.	10	L2	CO3
OR					
Q.6	a.	Explain the principles that guide each framework activity in the software engineering process.	10	L2	CO3
	b.	Describe Software Engineering Knowledge and its core principles.	10	L2	CO3

Module – 4					
Q.7	a.	What is Software Design? Explain the context of software engineering with a neat diagram.	10	L2	CO4
	b.	Briefly explain the fundamental design concepts such as abstraction, modularity, architecture and pattern.	10	L2	CO4
OR					
Q.8	a.	Write a note on Architectural Styles and Patterns.	10	L2	CO4
	b.	Explain the process of designing class based components in software engineering. Also discuss key principles such as Encapsulation and Coupling.	10	L2	CO4
Module – 5					
Q.9	a.	Define Software Testing. List and describe the various types of software testing strategies.	10	L2	CO5
	b.	Write a note on white box testing and black box testing.	10	L2	CO5
OR					
Q.10	a.	What is Software Quality? List and explain the metrics used for software quality.	10	L2	CO5
	b.	Discuss the concept of Software Quality Assurance (SQA) in detail.	10	L2	CO5

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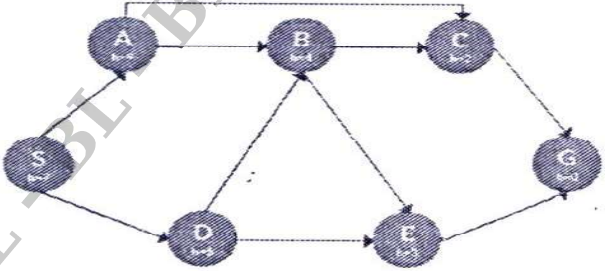
Fourth Semester B.E./B.Tech. Degree Examination, June / July 2026

Artificial Intelligence

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Define Artificial Intelligence and explain the four approaches of AI with examples.	10	L2	CO1
	b.	Compare and evaluate Goal – based and Utility- based agents.	10	L3	CO1
OR					
Q.2	a.	Define a Rational Agent and explain factors affecting rationality with example.	10	L2	CO1
	b.	Construct PEAS for an automated taxi driver system and explain each component.	10	L3	CO1
Module – 2					
Q.3	a.	Define Problem – Solving Agents. Explain the “ formulate – search – execute” cycle with a neat diagram.	10	L2	CO2
	b.	Analyze the advantages and disadvantages of Iterative Deepening Search (IDS) over BFS and DFS.	10	L4	CO2
OR					
Q.4	a.	Formulate the Vacuum Cleaner Problem as a search problem by defining states, actions, transition model, goal test, and path cost.	10	L3	CO2
	b.	Compare Breadth-First Search (BFS) and Depth – First Search (DFS) in terms of completeness, optimality, time complexity, and space complexity.	10	L4	CO2
Module – 3					
Q.5	a.	Explain Greedy Best – First Search algorithm. Discuss the advantages and limitations.	10	L2	CO3
	b.	Apply the Greedy best first search to find the solution path from S to G. Write all steps as well as open and closed lists for full marks. S (h = 7) , A (h = 9) , B (h = 4) , C (h = 5) , D (h = 5) , E (h = 3) , G (h = 0).  Fig. Q. 5 (b)	10	L3	CO3

OR

Q.6	a.	Explain Wumpus World problem with PEAS description and environment properties.	10	L2	CO3
	b.	Apply the A* search to find the solution path from a to z, Heuristics are with nodes, and cost is with edges. Write all steps as well as open and closed lists for full marks.	10	L3	CO3

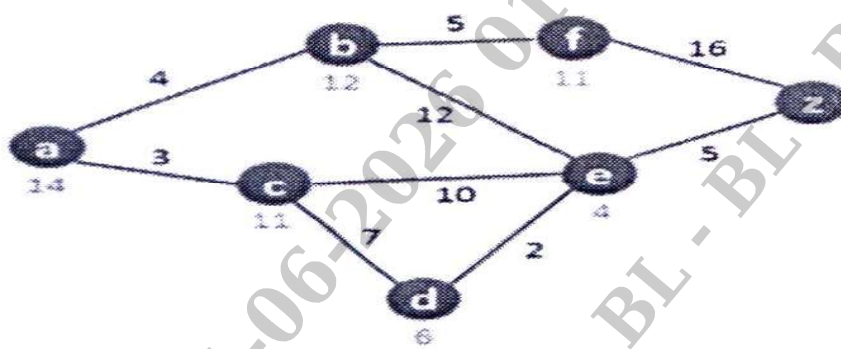


Fig. Q. 6 (b)

Module – 4

Q.7	a.	Differentiate between propositional logic and First – Order Logic in terms of ontological and epistemological commitments.	10	L2	CO4
	b.	Identify and represent the objects, relations, and functions in the following statements using First – Order Logic: i) “One plus two equals three” ii) “Squares neighboring the Wumpus are smelly” iii) “Evil King John ruled England in 1200”	10	L3	CO4

OR

Q.8	a.	Describe the structure of models in First – Order Logic and explain the role of interpretation.	10	L2	CO5
	b.	Construct First – Order Logic expressions using quantifiers for the following statements: i) All kings are persons ii) King John has a crown iii) Everyone loves someone iv) Someone is loved by everyone.	10	L3	CO5

Module – 5

Q.9	a.	Explain Backward Chaining algorithm with an example.	10	L2	CO5
	b.	Explain and derive Baye’s Theorem and analyze its role in diagnostic reasoning with suitable examples.	10	L3	CO5

OR

Q.10	a.	Explain the concept of acting under uncertainty in intelligent agents and discuss why logical reasoning alone is insufficient in uncertain environments.	10	L2	CO5
	b.	Write the representation of Bayes Theorem. In a class, 70% children were fall sick due to Viral fever and 30% due to Bacterial fever. The probability of observing temperature for Viral is 0.78 and for Bacterial is 0.31. If a child develops high temperature, find the child’s probability of having viral infection.	10	L3	CO5

CBCS SCHEME

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BAI515A

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026

Computer Vision

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1				M	L	C
Q.1	a.	What is Computer Vision? And discuss the real world examples of computer vision.	6	L2	CO1	
	b.	Compare Diffuse and Specular reflections.	8	L2	CO1	
	c.	Explain the histogram equalization.	6	L2	CO1	
OR						
Q.2	a.	Explain image sensing pipeline with block diagram.	6	L2	CO1	
	b.	Explain Phong shading model with diagram.	8	L2	CO1	
	c.	Explain the linear filtering with example.	6	L2	CO1	
Module – 2						
Q.3	a.	What is guided image filtering? Explain.	6	L2	CO2	
	b.	Compare FFT and DCT.	6	L2	CO2	
	c.	What are morphological operations explain any two?	8	L2	CO2	
OR						
Q.4	a.	Explain interpolation and decimation of an image.	6	L2	CO2	
	b.	Explain two dimensional wavelet decomposition.	6	L2	CO2	
	c.	Compare forward and inverse warping algorithm.	8	L2	CO2	
Module – 3						
Q.5	a.	Explain the image degradation and restoration process.	10	L2	CO3	
	b.	What is thresholding? Explain basic global thresholding with example.	10	L2	CO3	

OR

Q.6	a.	Explain Gaussian and Gamma noise model.	10	L2	CO3
	b.	Compare segmentation by region growing and region splitting and merging.	10	L2	CO3

Module – 4

Q.7	a.	Explain primary and secondary colors of light and pigments.	6	L2	CO4
	b.	Explain CMY and CMYK color models.	8	L2	CO4
	c.	Explain intensity slicing and color coding.	6	L2	CO4

OR

Q.8	a.	Explain pseudocolor image processing with neat block diagram.	6	L2	CO4
	b.	Explain how color is used in image segmentation.	8	L2	CO4
	c.	How you convert colors from HSI to RGB?	6	L2	CO4

Module – 5

Q.9	a.	Explain erosion and dilation with example.	8	L2	CO5
	b.	How chain codes are used to represent boundary?	6	L2	CO5
	c.	Explain importance of structural patterns.	6	L2	CO5

OR

Q.10	a.	Illustrate minimum distance classifier for two classes in 2D.	8	L2	CO5
	b.	Explain thinning and thickening in morphological image processing.	6	L2	CO5
	c.	Explain signatures and how these are generated.	6	L2	CO5

CBCS SCHEME

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BAD/BDS601

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026

Big Data Analytics

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Explain the classification of data in detail.	10	L2	CO1
	b.	What is Big Data? Explain the characteristics of Big Data.	4	L2	CO1
	c.	Discuss the evolution of Big Data.	6	L2	CO1
OR					
Q.2	a.	What is Big Data Analytics? Explain the classification of Analytics.	10	L2	CO1
	b.	Define NoSQL. Explain the types of NoSQL.	5	L1	CO1
	c.	Explain the advantages of NoSQL.	5	L2	CO1
Module – 2					
Q.3	a.	Explain Hadoop Distributed File System.	10	L2	CO2
	b.	Compare RDBMS and Hadoop.	5	L2	CO2
	c.	Explain High Level Architecture of Hadoop.	5	L2	CO2
OR					
Q.4	a.	Describe the chores of Mapper, Combiner, Partitioner and Reducer for the word count problem.	10	L2	CO2
	b.	Develop MapReduce program for matrix multiplication.	10	L3	CO2

Module – 3					
Q.5	a.	What is MongoDB? Explain the features of MongoDB.	10	L3	CO3
	b.	Explain how CRUD operations are performed with an example in MongoDB.	10	L2	CO3
OR					
Q.6	a.	Explain count(), limit(), sort(), Aggregate() and MapReduce() functions with an example in MongoDB.	10	L2	CO3
	b.	Explain how Arrays are used in MongoDB with proper example.	10	L2	CO3
Module – 4					
Q.7	a.	What is Hive? Explain the features and data units of Hive.	7	L2	CO4
	b.	Explain the Hive architecture with neat diagram.	8	L2	CO4
	c.	Explain DDL and DML in Hive.	5	L2	CO4
OR					
Q.8	a.	What is Pig? Explain the features of Pig.	5	L2	CO4
	b.	Discuss Relational operators in Pig with proper example.	10	L2	CO4
	c.	Explain evaluation functions with proper example.	5	L2	CO4
Module – 5					
Q.9	a.	What is Spark? Explain Five layer architecture for running applications using spark.	10	L2	CO5
	b.	What is Data Analysis? Explain the steps in data analysis with spark neat diagram.	10	L2	CO5
OR					
Q.10	a.	Explain with block diagram and Text Mining Process and explain its phases.	10	L2	CO5
	b.	What is Web Mining? Explain the process of web usage mining with neat diagram.	10	L2	CO5

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Artificial Intelligence and Machine Learning

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Define Artificial Intelligence. Explain in detail the foundations of AI.	10	L2	CO1
	b.	Describe the concept of Simple Reflex Agent and Goal based agent with a neat diagram.	10	L2	CO1
OR					
Q.2	a.	Describe the various properties of Task environment with relevant examples.	10	L2	CO1
	b.	Describe the concept of Model-based Reflex agents and Utility based agents with a neat diagram.	10	L2	CO1
Module – 2					
Q.3	a.	Explain 5 components for a well-defined problem by considering an 8-puzzle problem as an example.	10	L2	CO2
	b.	Explain uniform-cost search strategy algorithm by considering a suitable example to find the path from C to Z. [Refer Fig.Q3(b)]	10	L2	CO2
Fig.Q3(b)					
OR					
Q.4	a.	Define Heuristic Function. Explain Greedy best first search and solve for the following graph to find path from the initial state 'A' to the goal state 'G'. [Refer Fig.Q4(a)]	10	L2	CO2
Fig.Q4(a) [NOTE: number associated with each node is heuristic value]					
	b.	Explain A* search algorithm for minimizing the total estimated solution cost.	10	L2	CO2
Module – 3					
Q.5	a.	Define Machine Learning. List and explain the types of machine learning.	10	L2	CO3
	b.	Explain atleast 5 charts in detail that help in univariate data visualization.	10	L2	CO3

OR

Q.6	a.	Explain in detail the Machine Learning process model with relevant diagram.	08	L2	CO3
	b.	For the given univariate dataset $S = \{10, 15, 5, 20, 25, 30\}$ of marks. Calculate the following: i) Mean, Median ii) Variance and Standard deviation iii) Five-point summary with boxplot iv) Geometric mean	12	L3	CO3

Module – 4

Q.7	a.	Solve the following numerical: i) Find the correlation coefficient of the data hours studied $(x) = \{2, 4, 6, 8, 10\}$ and Test scores $(y) = \{45, 50, 65, 70, 85\}$ ii) Solve the following set of equations using Gaussian elimination method $2x_1 + 4x_2 = 6$ and $4x_1 + 3x_2 = 7$.	10	L3	CO4
	b.	Explain the following : i) Feature Engineering ii) Singular Value Decomposition	10	L2	CO4

OR

Q.8	a.	Write Fins-S Algorithm. Apply the same on the following data set for the target “Job Offer” :					12	L3	CO4		
		CGPA	Interactive-ness	Practical Knowledge	Communi- cation Skills	Logical Thinking				Interest	Job Offer
		≥ 9	Yes	Excellent	Good	Fast				Yes	Yes
		≥ 9	Yes	Good	Good	Fast				Yes	Yes
		≥ 8	No	Good	Good	Fast				No	No
		≥ 9	Yes	Good	Good	Slow				No	Yes
	b.	Write the algorithm for the following : i) K-nearest Neighbour Algorithm ii) Weighted K-Nearest Neighbour Algorithm					08	L2	CO4		

Module – 5

Q.9	a.	Explain with neat diagram McCulloch and Pitts Model of an artificial neuron along with any 5 activation functions.	10	L2	CO5
	b.	Describe with neat diagram the Perception Learning Model. Write the relevant algorithm.	10	L2	CO5

OR

Q.10	a.	Explain the different types of Artificial Neural Networks with a neat diagram.	08	L2	CO5
	b.	Consider the network architecture with 4 input units and 2 output units. Train the Self-Organizing Feature Map (SOFM) networks by determining class memberships of the input data. $x_1 : (1, 0, 1, 0)$ $x_2 : (1, 0, 0, 0)$ $x_3 : (1, 1, 1, 1)$ $x_4 : (0, 1, 1, 0)$ Output Units : Unit 1, Unit 2 Learning rate $\eta = 0.6$ Initial weight matrix $\begin{bmatrix} \text{Unit 1} \\ \text{Unit 2} \end{bmatrix} : \begin{bmatrix} 0.3 & 0.5 & 0.7 & 0.2 \\ 0.6 & 0.5 & 0.4 & 0.2 \end{bmatrix}$	12	L3	CO5

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BAD613B

Sixth Semester B.E./B.Tech. Degree Examination, June / July 2026 Natural Language Processing

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Define Natural Language Processing. What are the challenges of NLP?	08	L1	CO1
	b.	Illustrate with suitable examples the different levels in Natural Language Processing.	08	L2	CO1
	c.	Calculate the smoothed count for 5, by consider that the number of n – grams that occur 4 times in 25,108 and the number of n – grams that occur 5 times is 20,542.	04	L3	CO1
OR					
Q.2	a.	List and explain the components of transformational grammar with the help of an example.	07	L2	CO1
	b.	List the problems associated with N – gram model. Explain how these problems are handled.	07	L2	CO1
	c.	List and explain the applications of NLP.	06	L2	CO1
Module – 2					
Q.3	a.	What is morphological parsing? List and explain the classes or morphemes.	07	L2	CO2
	b.	Explain Top – down and Bottom – up parsing with example.	07	L2	CO2
	c.	For the given Context Free Grammar (CFG) $S \rightarrow AB/BC$ $A \rightarrow BA/a$ $B \rightarrow CC/b$ $C \rightarrow AB/a$ Check whether the string (w) = 'aabab' is valid or not.	06	L3	CO2
OR					
Q.4	a.	Write CYK Algorithm for CFG.	05	L3	CO2
	b.	i) Compute the minimum edit distance between tutor and tamour. ii) Compute the minimum edit distance between "azcde" and "abcdef".	08	L3	CO2
	c.	Illustrate Spelling Error Detection and Correction in word level analysis.	07	L2	CO2

Module – 3

Q.5	a.	Explain working of Naive Bayes Algorithm using add – 1 smoothing.	10	L3	CO3																	
	b.	Compute the probabilities for the following trained dataset by using the Naïve Bayes with add – one smoothing use a sentiment analysis domain with the two classes positive (+) and negative (-) and take the following miniature training and test documents simplified from actual movie reviews. <table border="1"><tr><td></td><td>Cat</td><td>Documents</td></tr><tr><td rowspan="5">Testing</td><td>-</td><td>Just plain boring</td></tr><tr><td>-</td><td>Entirely predictable and lacks energy</td></tr><tr><td>-</td><td>no surprises and very few laughs.</td></tr><tr><td>+</td><td>Very powerful</td></tr><tr><td>+</td><td>The most fun film of the summer.</td></tr><tr><td>Test</td><td>?</td><td>Predictable with no fun</td></tr></table>		Cat	Documents	Testing	-	Just plain boring	-	Entirely predictable and lacks energy	-	no surprises and very few laughs.	+	Very powerful	+	The most fun film of the summer.	Test	?	Predictable with no fun	10	L3	CO3
	Cat	Documents																				
Testing	-	Just plain boring																				
	-	Entirely predictable and lacks energy																				
	-	no surprises and very few laughs.																				
	+	Very powerful																				
	+	The most fun film of the summer.																				
Test	?	Predictable with no fun																				

OR

Q.6	a.	List the different types language model using Naïve Bayes. Explain any one briefly.	06	L2	CO3
	b.	With an example explain binarization for the binary Naïve Bayes algorithm.	08	L3	CO3
	c.	How can you use Naïve Bayes for a variety of text classification tasks?	06	L2	CO3

Module – 4

Q.7	a.	With a neat diagram, explain the basic information retrieval process.	05	L2	CO4
	b.	With an example, explain the Boolean and vector space model of information retrieval.	10	L2	CO4
	c.	How stemming affects the performance of the IR system?	05	L2	CO5

OR

Q.8	a.	Explain the fuzzy model in IR with a suitable example.	10	L2	CO4
	b.	Write a short notes on : i) Indexing ii) LSIM model	10	L2	CO4

Module – 5

Q.9	a.	Explain Lexical Divergences in MT.	08	L2	CO5
	b.	With a neat diagram, explain the Encoder – Decoder model in Machine Translation (MT).	12	L2	CO5

OR

Q.10	a.	Explain automatic evaluation in various forms. List out ethical issues raised in Machine Translation (MT).	10	L2	CO5
	b.	List and explain the dimensions used to evaluate the translations. And explain the automatic evaluation by character overlap (ChrF).	10	L2	CO5

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BAI654D

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026

Introduction to Artificial Intelligence

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Discuss the classification of AI tasks with illustration.	10	L1	CO1
	b.	What are the essential characteristics of a problem to build an efficient solution?	10	L1	CO1
OR					
Q.2	a.	Explain the problem as a state space search by considering an example.	10	L2	CO1
	b.	There are 2 water Jugs of 3 and 4 litre. Neither has any measuring marker. There is a tap that can be used to fill the Jugs with water. Indicate how 4 litre Jug can be filled with 2 litre. Solve this Water – Jug problem by giving complete set of production rules and state space tree.	10	L3	CO1
Module – 2					
Q.3	a.	Briefly explain the four approaches of knowledge representation with an example.	10	L1	CO1
	b.	List the draw backs of propositional logic.	4	L1	CO2
	c.	Differentiate between Procedural and Declarative knowledge.	6	L2	CO2
OR					
Q.4	a.	Compare Forward and Backward reasoning by considering an example of 8 puzzle.	10	L2	CO2
	b.	For the following sentences write predicate logic. 1. Marcus was a man 2. Marcus was a Pompeian 3. All Pompeian were Romans 4. Caesar was a ruler 5. All Romans were either loyal to Caesar or hated him 6. Everyone is loyal to someone 7. People only try to assassinate rulers they are not loyal to 8. Marcus tried to assassinate Caesar 9. All men are people 10. The rose is red.	10	L3	CO2

Module – 3

Q.5	a.	What is non monotonic reasoning? Explain the 2 approaches of default reasoning.	10	L2	CO3
	b.	Explain minimalist reasoning with example.	10	L1	CO3

OR

Q.6	a.	Explain Dempster – Shafer theory with example.	10	L1	CO3
	b.	State and prove Bayes Theorem for conditional probability.	10	L1	CO3

Module – 4

Q.7	a.	Briefly explain the MINIMAX algorithm with example.	10	L2	CO3
	b.	Explain iterative deepening. Write algorithm of depth first iterative deepening and iterative deeping A*.	10	L2	CO3

OR

Q.8	a.	Explain the different steps in natural language understanding process.	10	L2	CO3
	b.	With example explain Soundex algorithm.	10	L2	CO3

Module – 5

Q.9	a.	Define Learning. Explain Learning by taking advice.	10	L1	CO3
	b.	Explain the following learning technique. i) Learning by parameter adjustment ii) Learning with Macro operators.	10	L1	CO3

OR

Q.10	a.	Explain Winston Learning System.	10	L1	CO3
	b.	Explain MOLE knowledge acquisition system for heuristic classification problems.	10	L2	CO3

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CBCS SCHEME

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BCA701

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

Deep Learning

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M: Marks, L: Bloom's level, C: Course outcomes.

Module – 1			M	L	C																		
Q.1	a.	Define Neural Network. Explain models of neural with relevant equations and diagrams.	10	L2	CO1																		
	b.	Define Feedback and derive the transfer function of the neural network for a single hoop feedback system.	10	L2	CO1																		
OR																							
Q.2	a.	Define Perceptron. Explain Perceptron convergence theorem with relevant equations and diagrams.	10	L2	CO1																		
	b.	Explain the relation between the Perceptron and Bayes classifier for a Gaussian environment with relevant equations.	10	L2	CO1																		
Module – 2																							
Q.3	a.	Derive Back-propagation algorithm with relevant equations and diagrams.	10	L2	CO2																		
	b.	Define Batch learning and outline learning. Derive relevant equations for back-propagation algorithm when: i) Logistic activation function. ii) Tan hyperbolic activation function is applied.	10	L2	CO2																		
OR																							
Q.4	a.	Construct a Multi-Layer Perceptron (MLP) for XOR problem with following conditions as follows: i) And function <table><tr><td>W₁₁</td><td>+1</td></tr><tr><td>W₁₂</td><td>+1</td></tr><tr><td>b₁</td><td>-3/2</td></tr></table> ii) OR function <table><tr><td>W₂₁</td><td>+1</td></tr><tr><td>W₂₂</td><td>+1</td></tr><tr><td>b₂</td><td>-1/2</td></tr></table> iii) XOR function <table><tr><td>W₃₁</td><td>-2</td></tr><tr><td>W₃₂</td><td>+1</td></tr><tr><td>b₃</td><td>-1/2</td></tr></table>	W ₁₁	+1	W ₁₂	+1	b ₁	-3/2	W ₂₁	+1	W ₂₂	+1	b ₂	-1/2	W ₃₁	-2	W ₃₂	+1	b ₃	-1/2	10	L3	CO2
W ₁₁	+1																						
W ₁₂	+1																						
b ₁	-3/2																						
W ₂₁	+1																						
W ₂₂	+1																						
b ₂	-1/2																						
W ₃₁	-2																						
W ₃₂	+1																						
b ₃	-1/2																						

	b.	Write a program to demonstrate classification of MNIST digits image dataset using Multi Layer Perception (MLP) Neural Network for Ten classes. Consider the input image of size 28×28. Consider two hidden layer with first hidden layer incorporating 128 neurons and second hidden layer incorporating 64 neurons. Consider ReLU activation function as an activation function in the hidden layers. Write the model summary and also show the parameter calculations for each of the hidden layers.	10	L3	CO2
Module – 3					
Q.5	a.	Define Regularization. Explain L^2 parameter regularization with relevant equations and diagrams.	10	L2	CO3
	b.	Implement a program to enable pre-trained model (VGG 16) to classify an image data set. Consider MNIST digits image dataset with input image of size 28×28. Write Model Summary.	10	L3	CO3
OR					
Q.6	a.	Explain challenges involved in neural Network optimization such as ill-conditioning, local Minima with relevant equation and diagrams.	10	L2	CO3
	b.	Explain Dataset Augmentation and Semi-Supervised learning.	10	L2	CO3
Module – 4					
Q.7	a.	Implement a program for the classification of fruits dataset using deep convolution Neural Network (CNN) which consists of three convolutional layers and three pooling layers. The input image is an RGB image 10 of size 160×160. The different kinds of fruits considered are Banana, Apple, Mango, Orange and Pomegranate. The number of kernels in the first, second and third convocational layers are 32, 64, 128. The kernel size in each of the convolutional layer is 3×3. The pooling technique used is max-pooling 2D. Write the model summary. Show the parameter calculations for each of the convolutional layers.	10	L3	CO4

	b.	Define Pooling. Consider the 4×4 input as follows: <table><tr><td>5</td><td>7</td><td>8</td><td>9</td></tr><tr><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>2</td><td>3</td><td>4</td><td>5</td></tr></table> Solve to find the output of the Pooling technique: i) Max-Pooling2D. ii) Sum-Pooling2D. iii) Average Pooling2D. iv) Global Max-Pooling. v) Global Average-Pooling.	5	7	8	9	3	4	5	6	1	2	3	4	2	3	4	5	10	L3	CO4
5	7	8	9																		
3	4	5	6																		
1	2	3	4																		
2	3	4	5																		
OR																					
Q.8	a.	Explain motivation behind deep CNN. Write the block diagram of CNN as infinitely strong pair for multi-class classification (1000 classes) of an image dataset.	10	L2	CO4																
	b.	Explain Variants of basic convolution function with relevant equations and diagrams. Explain different forms of data OR data types in convolutional Networks.	10	L2	CO4																
Module – 5																					
Q.9	a.	Explain Recurrent Neural Network (RNN) and Bidirectional RNN with relevant equations and diagrams.	10	L2	CO5																
	b.	Build and demonstrate an Autoencoder Network using Neural layers for data compression on image dataset. Consider MNIST digits image dataset with 10 classes and input image of size 28 × 28. Consider 3 hidden layers with each layer incorporating 32, 64, 128 neurons and ReLu is used as activation function.	10	L2	CO5																
OR																					
Q.10	a.	Explain Long-Short Term Memory (LSTM) Neural Network with relevant equations and diagrams.	10	L2	CO5																
	b.	Explain Deep-Recurrent Networks and Recursive Neural Networks with relevant equations and diagrams.	10	L2	CO5																

First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026

Introduction to AI and Applications

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M : Marks, L: Bloom's level, C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Define Artificial Intelligence from Researchers perspective. List and Describe the classification of AI based on capabilities and functionalities.	10	L2	CO1
	b.	Define Learning. List and describe any four types of Learning with example for each.	10	L2	CO1
OR					
Q.2	a.	Define uninformed Search. With an example describe the steps involved in DFS algorithm.	10	L2	CO1
	b.	Define Reasoning. Describe Inductive and Deductive reasoning with example for each.	10	L2	CO1
Module – 2					
Q.3	a.	Define Prompt. List and describe the steps involved in Prompt Engineering.	10	L2	CO4
	b.	Write a suitable prompt for generating content reflecting the “Dialogue between two people who have just met for the first time” at initial and refined level with expected results of the prompt and proper justification for each.	10	L4	CO4
OR					
Q.4	a.	List and describe any 5 key principles for fostering innovation.	10	L2	CO4
	b.	Write a suitable prompt for generating content reflecting the “Impact of a creative mindset on problem-solving and innovation” at initial and refined level with expected results of the prompt and proper justification for each.	10	L4	CO4
Module – 3					
Q.5	a.	Define Machine Learning as per Professor Mitchell. Describe Supervised and Unsupervised Learning with an example for each.	10	L2	CO2
	b.	Write the formula for computing Euclidian distance. Compute the nearest neighbor of point (7,6) from points [(3,5) (9,7) (6,4) (9,3)] using Euclidian distance.	10	L4	CO2
OR					
Q.6	a.	List the advantages and disadvantages of K Nearest Neighbor classification technique.	10	L2	CO2
	b.	With a suitable example, Describe the K-Means Clustering algorithm.	10	L4	CO2

Module – 4

Q.7	a.	List and Describe any five Ethical concerns with respect to Artificial Intelligence.	10	L2	CO3
	b.	Describe the impact of Artificial Intelligence in the field of Medical, Automotive, Cyber Security and Legal Profession.	10	L3	CO3

OR

Q.8	a.	List and Describe the challenges involved in AI as a Service (AIaaS).	10	L2	CO3
	b.	Describe the importance of User Interface, Inference Engine, Forward and Backward Chaining and Knowledge Base in an Expert System.	10	L3	CO3

Module – 5

Q.9	a.	List any five differences between Traditional and Low Code development tools.	10	L3	CO3
	b.	Describe any five applications of AI in Healthcare.	10	L2	CO3

OR

Q.10	a.	List and Describe any five No Code AI tools and their usage.	10	L3	CO3
	b.	Describe any five applications of AI in Education.	10	L2	CO3

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First/Second Semester B.E./B.Tech. Degree Examination, June/July 2026 Introduction to AI and Applications

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.

2. M : Marks, L: Bloom's level, C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Define Artificial Intelligence from Researchers perspective. List and Describe the classification of AI based on capabilities and functionalities.	10	L2	CO1
	b.	Define Learning. List and describe any four types of Learning with example for each.	10	L2	CO1
OR					
Q.2	a.	Define uninformed Search. With an example describe the steps involved in DFS algorithm.	10	L2	CO1
	b.	Define Reasoning. Describe Inductive and Deductive reasoning with example for each.	10	L2	CO1
Module – 2					
Q.3	a.	Define Prompt. List and describe the steps involved in Prompt Engineering.	10	L2	CO4
	b.	Write a suitable prompt for generating content reflecting the “Dialogue between two people who have just met for the first time” at initial and refined level with expected results of the prompt and proper justification for each.	10	L4	CO4
OR					
Q.4	a.	List and describe any 5 key principles for fostering innovation.	10	L2	CO4
	b.	Write a suitable prompt for generating content reflecting the “Impact of a creative mindset on problem-solving and innovation” at initial and refined level with expected results of the prompt and proper justification for each.	10	L4	CO4
Module – 3					
Q.5	a.	Define Machine Learning as per Professor Mitchell. Describe Supervised and Unsupervised Learning with an example for each.	10	L2	CO2
	b.	Write the formula for computing Euclidian distance. Compute the nearest neighbor of point (7,6) from points [(3,5) (9,7) (6,4) (9,3)] using Euclidian distance.	10	L4	CO2
OR					
Q.6	a.	List the advantages and disadvantages of K Nearest Neighbor classification technique.	10	L2	CO2
	b.	With a suitable example, Describe the K-Means Clustering algorithm.	10	L4	CO2

Module – 4

Q.7	a.	List and Describe any five Ethical concerns with respect to Artificial Intelligence.	10	L2	CO3
	b.	Describe the impact of Artificial Intelligence in the field of Medical, Automotive, Cyber Security and Legal Profession.	10	L3	CO3

OR

Q.8	a.	List and Describe the challenges involved in AI as a Service (AIaaS).	10	L2	CO3
	b.	Describe the importance of User Interface, Inference Engine, Forward and Backward Chaining and Knowledge Base in an Expert System.	10	L3	CO3

Module – 5

Q.9	a.	List any five differences between Traditional and Low Code development tools.	10	L3	CO3
	b.	Describe any five applications of AI in Healthcare.	10	L2	CO3

OR

Q.10	a.	List and Describe any five No Code AI tools and their usage.	10	L3	CO3
	b.	Describe any five applications of AI in Education.	10	L2	CO3

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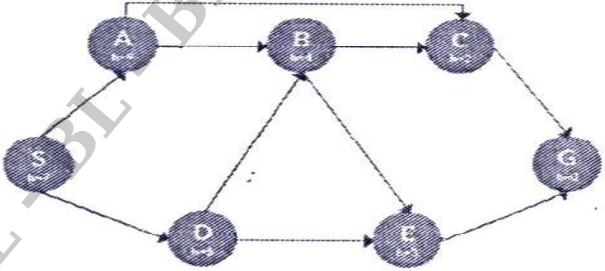
Fourth Semester B.E./B.Tech. Degree Examination, June / July 2026

Artificial Intelligence

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Define Artificial Intelligence and explain the four approaches of AI with examples.	10	L2	CO1
	b.	Compare and evaluate Goal – based and Utility- based agents.	10	L3	CO1
OR					
Q.2	a.	Define a Rational Agent and explain factors affecting rationality with example.	10	L2	CO1
	b.	Construct PEAS for an automated taxi driver system and explain each component.	10	L3	CO1
Module – 2					
Q.3	a.	Define Problem – Solving Agents. Explain the “ formulate – search – execute” cycle with a neat diagram.	10	L2	CO2
	b.	Analyze the advantages and disadvantages of Iterative Deepening Search (IDS) over BFS and DFS.	10	L4	CO2
OR					
Q.4	a.	Formulate the Vacuum Cleaner Problem as a search problem by defining states, actions, transition model, goal test, and path cost.	10	L3	CO2
	b.	Compare Breadth-First Search (BFS) and Depth – First Search (DFS) in terms of completeness, optimality, time complexity, and space complexity.	10	L4	CO2
Module – 3					
Q.5	a.	Explain Greedy Best – First Search algorithm. Discuss the advantages and limitations.	10	L2	CO3
	b.	Apply the Greedy best first search to find the solution path from S to G. Write all steps as well as open and closed lists for full marks. S (h = 7) , A (h = 9) , B (h = 4) , C (h = 5) , D (h = 5) , E (h = 3) , G (h = 0).	10	L3	CO3
			Fig. Q. 5 (b)		

OR

Q.6	a.	Explain Wumpus World problem with PEAS description and environment properties.	10	L2	CO3
	b.	Apply the A* search to find the solution path from a to z, Heuristics are with nodes, and cost is with edges. Write all steps as well as open and closed lists for full marks.	10	L3	CO3

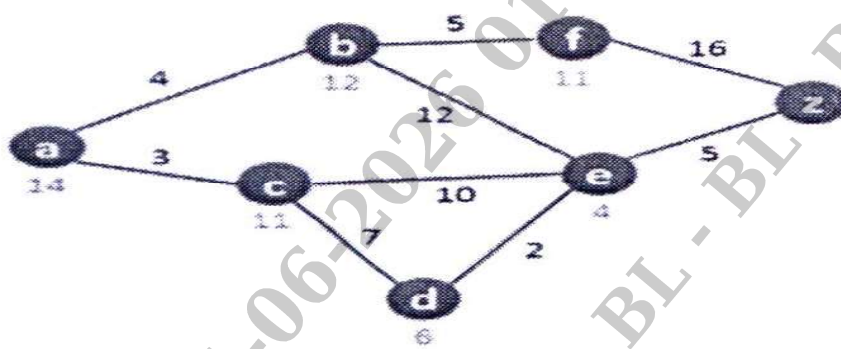


Fig. Q. 6 (b)

Module – 4

Q.7	a.	Differentiate between propositional logic and First – Order Logic in terms of ontological and epistemological commitments.	10	L2	CO4
	b.	Identify and represent the objects, relations, and functions in the following statements using First – Order Logic: i) “One plus two equals three” ii) “Squares neighboring the Wumpus are smelly” iii) “Evil King John ruled England in 1200”	10	L3	CO4

OR

Q.8	a.	Describe the structure of models in First – Order Logic and explain the role of interpretation.	10	L2	CO5
	b.	Construct First – Order Logic expressions using quantifiers for the following statements: i) All kings are persons ii) King John has a crown iii) Everyone loves someone iv) Someone is loved by everyone.	10	L3	CO5

Module – 5

Q.9	a.	Explain Backward Chaining algorithm with an example.	10	L2	CO5
	b.	Explain and derive Baye’s Theorem and analyze its role in diagnostic reasoning with suitable examples.	10	L3	CO5

OR

Q.10	a.	Explain the concept of acting under uncertainty in intelligent agents and discuss why logical reasoning alone is insufficient in uncertain environments.	10	L2	CO5
	b.	Write the representation of Bayes Theorem. In a class, 70% children were fall sick due to Viral fever and 30% due to Bacterial fever. The probability of observing temperature for Viral is 0.78 and for Bacterial is 0.31. If a child develops high temperature, find the child’s probability of having viral infection.	10	L3	CO5

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BAI515A

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2026

Computer Vision

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1				M	L	C
Q.1	a.	What is Computer Vision? And discuss the real world examples of computer vision.	6	L2	CO1	
	b.	Compare Diffuse and Specular reflections.	8	L2	CO1	
	c.	Explain the histogram equalization.	6	L2	CO1	
OR						
Q.2	a.	Explain image sensing pipeline with block diagram.	6	L2	CO1	
	b.	Explain Phong shading model with diagram.	8	L2	CO1	
	c.	Explain the linear filtering with example.	6	L2	CO1	
Module – 2						
Q.3	a.	What is guided image filtering? Explain.	6	L2	CO2	
	b.	Compare FFT and DCT.	6	L2	CO2	
	c.	What are morphological operations explain any two?	8	L2	CO2	
OR						
Q.4	a.	Explain interpolation and decimation of an image.	6	L2	CO2	
	b.	Explain two dimensional wavelet decomposition.	6	L2	CO2	
	c.	Compare forward and inverse warping algorithm.	8	L2	CO2	
Module – 3						
Q.5	a.	Explain the image degradation and restoration process.	10	L2	CO3	
	b.	What is thresholding? Explain basic global thresholding with example.	10	L2	CO3	

OR

Q.6	a.	Explain Gaussian and Gamma noise model.	10	L2	CO3
	b.	Compare segmentation by region growing and region splitting and merging.	10	L2	CO3

Module – 4

Q.7	a.	Explain primary and secondary colors of light and pigments.	6	L2	CO4
	b.	Explain CMY and CMYK color models.	8	L2	CO4
	c.	Explain intensity slicing and color coding.	6	L2	CO4

OR

Q.8	a.	Explain pseudocolor image processing with neat block diagram.	6	L2	CO4
	b.	Explain how color is used in image segmentation.	8	L2	CO4
	c.	How you convert colors from HSI to RGB?	6	L2	CO4

Module – 5

Q.9	a.	Explain erosion and dilation with example.	8	L2	CO5
	b.	How chain codes are used to represent boundary?	6	L2	CO5
	c.	Explain importance of structural patterns.	6	L2	CO5

OR

Q.10	a.	Illustrate minimum distance classifier for two classes in 2D.	8	L2	CO5
	b.	Explain thinning and thickening in morphological image processing.	6	L2	CO5
	c.	Explain signatures and how these are generated.	6	L2	CO5

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Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026
Machine Learning – II

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

Module – 1			M	L	C
Q.1	a.	Describe the steps in designing a machine learning system using an example.	10	L2	CO1
	b.	Describe the Candidate – Elimination Algorithm with example.	10	L2	CO1
OR					
Q.2	a.	Explain Inductive Bias. Why is it necessary in ML?	10	L2	CO1
	b.	Explain the perspective and key issues in machine learning.	10	L2	CO1
Module – 2					
Q.3	a.	Explain the Sequential Covering Algorithm for rule learning with an example.	10	L2	CO2
	b.	Describe Explanation – Based Learning (EBL) with an example what are its key assumptions?	10	L2	CO2
OR					
Q.4	a.	What are the Key Properties of EBL? What are the limitations and explanation based learning?	10	L1	CO2
	b.	Describes how EBL derives Search Control Knowledge.	10	L2	CO2
Module – 3					
Q.5	a.	What is Adaboost? Explain the working method of Adaboost.	10	L2	CO3
	b.	Explain the effectiveness of different ways to combine classifiers in ensemble learning.	10	L2	CO3

OR					
Q.6	a.	Explain the K-means algorithm in detail.	10	L2	CO3
	b.	Describe how Random Forests use ensemble learning to improve prediction accuracy.	10	L2	CO3
Module – 4					
Q.7	a.	What is Vector Quantization? How it is used in unsupervised learning?	10	L1	CO4
	b.	Explain the concept of a Self – Organizing Feature Map (SOM) with example.	10	L2	CO4
OR					
Q.8	a.	Explain the Proposal Distribution Method in detail.	10	L2	CO4
	b.	Explain the concept of Markov Chain Monte Carlo in detail.	10	L2	CO4
Module – 5					
Q.9	a.	Explain the Bayesian Network in detail with example.	10	L2	CO4
	b.	How is approximate inference performed in Bayesian Networks? Explain.	10	L2	CO4
OR					
Q.10	a.	Explain the importance of Viterbi Algorithm and Forward Algorithm in HMMs.	10	L2	CO4
	b.	Describe the Baum-Welch Algorithm. Write the Python implementation code of Baum-Welch Algorithm.	10	L2	CO4

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BIS402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026 Advanced Java

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	What are Legacy Classes? Explain any four legacy classes of Java's collection frame work with suitable program.	10	L2	CO1
	b.	What are Comparators? Write a comparator program to sort accounts by last name.	10	L3	CO1
OR					
Q.2	a.	What is collection frame work? Explain methods defined by the following interfaces: i) Collection ii) List iii) Map iv) Queue	10	L2	CO1
	b.	Explain the following Map class with suitable program: i) Hash Map ii) Tree Map	10	L2	CO1
Module – 2					
Q.3	a.	Explain the following string comparison methods with examples: i) equals() ii) StartsWith() iii) endsWith() iv) regionMatches()	10	L2	CO2
	b.	Describe the data conversion using Value of ()	6	L2	CO2
	c.	Explain String Builders.	4	L1	CO2
OR					
Q.4	a.	Explain the various string constructors used in Java with example.	10	L2	CO2
	b.	Explain any two character extraction methods of string class.	5	L2	CO2
	c.	Explain any four string modification methods of string class.	5	L2	CO2

Module – 3

Q.5	a.	Describe components and containers in Java swing.	10	L2	CO3
	b.	Explain the following : i) JLabel and Image Icon ii) JTextField	10	L2	CO3

OR

Q.6	a.	How does event handling work in swing?	10	L2	CO3
	b.	Explain the four types of the swing buttons with demonstration program.	10	L3	CO3

Module – 4

Q.7	a.	Explain the differences between servlets and CGI programs.	5	L1	CO4
	b.	What is Cookie? Write a JSP program to create a Cookie and read a Cookie.	10	L3	CO4
	c.	Explain the life cycle of servlets.	5	L1	CO4

OR

Q.8	a.	Explain for loop, while loop and do... while loop to load HTML tables.	10	L2	CO4
	b.	Give step wise explanation to down load and install Tomcat.	10	L2	CO4

Module – 5

Q.9	a.	Explain the different types of statement object with examples.	10	L2	CO5
	b.	Explain the four types of JDBC drivers.	10	L2	CO5

OR

Q.10	a.	Write a Java program to execute a database transaction.	10	L4	CO5
	b.	Explain different steps involved in JDBC process with a code snippet.	10	L3	CO5

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21IS63

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Software Testing

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Identify and explain Fault Taxonomies with an example. (10 Marks)
- b. Explain the use of Venn diagram in Software Testing with diagrams. (10 Marks)

OR

- 2 a. Discuss the structured programming version of Improved Specification for triangle problem with Data flow diagram. (06 Marks)
- b. Explain various Software quality attributes. (08 Marks)
- c. Analyze and explain the SATM screen. (06 Marks)

Module-2

- 3 a. Briefly explain Generalized normal, Worst-Case and Robust boundary value and robust-worst-case BVA testing with input domain diagram for function of two variables. (08 Marks)
- b. Define equivalence class testing. Derive test-cases for weak robust equivalence class for commission problem. (08 Marks)
- c. Write a short note on Special Value Testing. (04 Marks)

OR

- 4 a. Explain the decision table for next date program under the Third-Try and also write the test-cases. (10 Marks)
- b. Explain each term related to decision table along with an example for a commission program and also write the test-cases. (10 Marks)

Module-3

- 5 a. Analyze and explain metric-based testing. (10 Marks)
- b. Design code in 'C' language to implement if a given year is a leap year or not. Using the basis path method, write different test-cases. (10 Marks)

OR

- 6 a. Consider the commission program and find the DU Paths for the following variables. Also identify whether these DU Paths are definition clear or not.
- i) Sales
 - ii) Total Stock
 - iii) Locks
- (10 Marks)
- b. Develop a Code in 'C' program to implement the binary search algorithm. Determine the basis path testing using different test-cases.
- (10 Marks)

Module-4

- 7 a. Explain Rapid Prototyping Life Cycle with diagram. (10 Marks)
- b. Explain Decomposition-Based integration. (10 Marks)

OR

- 8 a. Explain Level-1 dataflow diagram of the SATM System. (10 Marks)
- b. Explain the Call-Graph-Based integration. (10 Marks)

Module-5

- 9 a. With a neat diagram explain PIN try Finite State Machine of SATM. (10 Marks)
- b. Explain with an example Static Interaction in a single processor. (10 Marks)

OR

- 10 a. With a neat diagram explain Client/Server Testing. (10 Marks)
- b. Explain Hypothetical transition probabilities for the SATM system. (10 Marks)

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BIS601

Sixth Semester B.E./B.Tech. Degree Examination, June/July 2026 Full Stack Development

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	What is an array in Java Script? List out their key feature. Describe any three methods with example.	10	L2	CO1
	b.	Create an array of five cities and perform following operations in java script: i) Log total number of cities ii) Add new city at the end iii) Remove first city iv) Find the index of city	10	L3	CO1
OR					
Q.2	a.	Differentiate between primitive and non primitive data types.	10	L2	CO1
	b.	Write java script program for below i) Access only even numbers in the list ii) Check given string is polindrom	10	L3	CO1
Module – 2					
Q.3	a.	Define DOM. Discuss the below methods using Java Script. i) Selecting Element ii) Modifying Element iii) Adding Element	10	L2	CO2
	b.	Create a button in HTML with text “ClickMe”. Add an event listener to log “Button clicked” to the console when button is clicked.	10	L3	CO2
OR					
Q.4	a.	What is an Events? Explain any three types of Events with example.	10	L2	CO2
	b.	Write a Java Script to select an image in your HTML and add a mouseover event listener to change its border color.	10	L3	CO2
1 of 2					

Module – 3

Q.5	a.	Define MERN. What are the components of MERN? Mention the usage of each component.	10	L2	CO3
	b.	What is Issue Tracker? Explain their usages.	10	L2	CO3

OR

Q.6	a.	Explain the process of server-less Hello world with example.	10	L2	CO3
	b.	Explain the composing components with new structure of UI.	10	L2	CO3

Module – 4

Q.7	a.	What is GraphQL? List out the advantages of GraphQL with example of GraphQL query.	10	L2	CO4
	b.	What are the different way to implement validations in GraphQL?	10	L2	CO4

OR

Q.8	a.	Explain different types of errors in UI to improve the user experience.	10	L2	CO4
	b.	What is Express? Brief note on Express.	10	L2	CO4

Module – 5

Q.9	a.	What is MongoDB? Explain the key feature of MongoDB collections.	10	L2	CO5
	b.	Explain MongoDB CRUD operations.	10	L2	CO5

OR

Q.10	a.	What is Aggregation in MongoDB? Explain different Aggregation operations with example.	10	L2	CO5
	b.	Explain different steps for reading from MongoDB.	10	L2	CO5

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BIS613D

Sixth Semester B.E./B.Tech. Degree Examination, June / July 2026

Cloud Computing and Security

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Explain the Platform Evolution of different computer technologies with a neat diagram.	10	L2	CO1
	b.	Outline eight reasons to adopt the cloud for upgraded internet applications and web services.	08	L2	CO1
	c.	Briefly explain Message Passing Interface (MPI).	02	L2	CO1
OR					
Q.2	a.	Summarize all VM primitive operations with relevant diagram.	10	L2	CO1
	b.	Illustrate various system attacks and network threats to the cyber space, resulting in 4 types of losses with neat diagram.	10	L2	CO1
Module – 2					
Q.3	a.	Demonstrate the architecture of a computer system before and after virtualization.	10	L2	CO2
	b.	Compare physical versus virtual cluster.	10	L2	CO2
OR					
Q.4	a.	Construct the Live migration process of a VM from one host to another.	10	L3	CO2
	b.	Develop a architecture of live wire for intrusion detection using a dedication VM.	10	L3	CO2
Module – 3					
Q.5	a.	Outline six design objectives for cloud computing.	06	L2	CO3
	b.	With neat diagram, build a cloud ecosystem with private cloud.	08	L3	CO3
	c.	Organize functional modules of GAE.	06	L2	CO3
OR					
Q.6	a.	Identify basic requirements for managing the resources of a data center.	08	L3	CO3
	b.	Summarize six open challenges in cloud architecture development.	08	L2	CO3
	c.	Write a note on AWS.	04	L2	CO3
1 of 2					

Module – 4

Q.7	a.	Demonstrate surfaces of attacks in a cloud computing environment with neat diagram.	08	L2	CO4
	b.	List out the top cloud security threats of CSA2016.	06	L1	CO4
	c.	Select four widely accepted fair information that “ Consumer oriented commercial websites that collect personal identifying information from or about consumers online would be required to comply with.	06	L3	CO4

OR

Q.8	a.	Summarize the design goals of X _{gan} .	06	L2	CO4
	b.	Explain mobile devices and cloud security.	06	L2	CO4
	c.	Model an overview of reputation system design options.	08	L3	CO4

Module – 5

Q.9	a.	Outline important cloud platform capabilities.	10	L2	CO5
	b.	Organize the steps involved in Map Reduce.	10	L3	CO5

OR

Q.10	a.	Explain with a neat diagram how data flows if running a Map Reduce job at various task trackers using the hadoop library	10	L2	CO5
	b.	Explain data mutation sequence in GFS with diagram.	10	L2	CO5

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Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026

BIG Data Analytics

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	What is Big Data? With a diagram, explain the classification and characteristics of big data.	10	L2	CO1
	b.	What is Big Data Analytics? With a neat diagram explain classification of analytics.	10	L2	CO1
OR					
Q.2	a.	With a neat diagram, explain Hadoop environment.	10	L2	CO2
	b.	Write a note on NOSQL	10	L3	CO2
Module – 2					
Q.3	a.	Write the differences between RDBMS and Hadoop by considering atleast five parameters.	10	L3	CO2
	b.	With a neat diagram, explain high level architecture of Hadoop.	10	L2	CO2
OR					
Q.4	a.	With a neat diagram explain Hadoop distributed file system architecture.	10	L2	CO3
	b.	With a block diagram explain map reduce framework.	10	L2	CO3
Module – 3					
Q.5	a.	What is MongoDB? With respect to MongoDB explain the following : i) Sharding ii) Replication iii) Create and drop database.	10	L2	CO3
	b.	Explain different data types used in MongoDB.	10	L2	CO3
OR					
Q.6	a.	Write a note on MongoDB Query language.	10	L3	CO3
	b.	Write difference between RDBMS and MongoDB.	10	L3	CO3
1 of 2					

Module – 4

Q.7	a.	What is Hive? With a neat diagram explain the architecture of Hive.	10	L2	CO3
	b.	Explain different types of commands used for Query language.	10	L2	CO3

OR

Q.8	a.	What is Apache Pig? Explain the features and anatomy of using Apache Pig.	10	L2	CO3
	b.	List and explain Eval functions provided by Apache Pig.	10	L2	CO3

Module – 5

Q.9	a.	What is Spark? With neat diagram explain main components of the spark architecture and features of spark.	10	L2	CO3
	b.	Write spark SQL features and also explain connectivity between applications and spark SQL.	10	L3	CO3

OR

Q.10	a.	Define Text mining. Explain phases of text mining.	10	L1	CO4
	b.	Explain common web content mining techniques.	10	L2	CO4

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CBCS SCHEME

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BIS703

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Information and Network Security

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Give an introduction to cryptography and explain “How to speak crypto with standard terminology”.	8	L2	CO1
	b.	Explain classic cryptography and describe the simple substitution cipher with an example.	8	L2	CO1
	c.	Explain the cryptanalysis of a simple substitution cyper and define what is meant by a secure cipher.	4	L2	CO1
OR					
Q.2	a.	Explain the Double Transposition Cipher with an example.	8	L2	CO1
	b.	Explain the One – Time Pad and Project VENONA.	6	L2	CO1
	c.	Explain the code book cipher and the ciphers used in the U.S Election of 1876.	6	L2	CO1
Module – 2					
Q.3	a.	What is a Hash function? Explain the properties of a good cryptographic hash function.	8	L2	CO2
	b.	Explain the Birthday problem and its significance in hash function security.	6	L2	CO2
	c.	Differentiate between cryptographic and non – cryptographic hash functions.	6	L2	CO2
OR					
Q.4	a.	Explain the use of hash functions in real – world applications such as : i) Online bidding systems ii) Spam reduction iii) Other crypto – related applications.	8	L2	CO2
	b.	Explain Random number generation and generating random bits.	6	L2	CO2
	c.	Explain information hiding and its importance in cryptography.	6	L2	CO2
Module – 3					
Q.5	a.	Define Providing freshness. Explain the zero knowledge mechanism.	8	L3	CO3
	b.	Explain the fundamentals of entity authentication.	8	L3	CO3

	c.	Write a short note on further reading in authentication mechanism.	4	L3	CO3
OR					
Q.6	a.	Explain the fundamentals of key management in cryptographic systems.	8	L2	CO3
	b.	Analysis a simple cryptographic protocol , identifying attacks.	6	L2	CO3
	c.	Explain Authentication protocols and key establishment protocols with suitable examples.	6	L2	CO3
Module – 4					
Q.7	a.	Explain the basics of cryptographic protocols.	6	L2	CO4
	b.	Explain the processes of key generation , key establishment , key storage and key usage.	8	L2	CO4
	c.	Define Governing Key Management. Explain key management policies and controls.	6	L2	CO4
OR					
Q.8	a.	Describe the certificate lifecycle in detail.	6	L2	CO4
	b.	Explain different public – key management models.	6	L3	CO4
	c.	Discuss alternative approaches to public key management.	8	L3	CO4
Module – 5					
Q.9	a.	Explain the role of cryptography in securing the internet. Describe SSL / TLS and HTTPS.	8	L2	CO5
	b.	Explain how cryptography is used in Wireless Local Area Networks [WLANs].	8	L2	CO5
	c.	Describe the application of cryptography in mobile telecommunications.	4	L2	CO5
OR					
Q.10	a.	Explain the use of cryptography in secure payment card transactions.	6	L3	CO5
	b.	Describe the role of cryptography in video broadcasting systems.	6	L3	CO5
	c.	Explain how cryptography is applied in identity cards. Such as smart card and e – passports.	8	L2	CO5

CBCS SCHEME

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BIS714B

Seventh Semester B.E./B.Tech. Degree Examination, June/July 2026 Software Quality Assurance

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.*

Module – 1			M	L	C
Q.1	a.	Compare Industrial product and software product with an example.	10	L3	CO1
	b.	Describe the following characteristics of environment in which SQA methods are developed : (i) Contractual conditions (ii) Customer-supplier relationship (iii) Team work (iv) Cooperation with other software teams	10	L2	CO2
OR					
Q.2	a.	Compare software errors, faults and failures with suitable diagram.	10	L3	CO1
	b.	Describe how McCall's factor model classifies all software requirements into 11 software quality factors and how these Eleven quality factors are grouped into three categories. Mention them. Explain (i) Reliability (ii) Maintainability (iii) Portability	10	L2	CO2
Module – 2					
Q.3	a.	Describe the following with respect to SQA system architecture: (i) Pre-project components (ii) Components of Infrastructure error prevention (iii) Components of life cycle activities assessments. (iv) SQA-human component	10	L2	CO2
	b.	Explain the following with respect to software like cycle : (i) Expert opinion (ii) Software maintenance	10	L2	CO3
OR					
Q.4	a.	Describe the proposal draft review objectives which represent contract review objectives.	10	L2	CO2
	b.	Explain the recommended avenues for implementing major contract reviews.	10	L2	CO3
Module – 3					
Q.5	a.	Describe verification, validation and qualification with respect to quality assurance.	10	L2	CO3

	b.	Illustrate with example project factors and team factors that affect the required intensity of quality assurance activities.	10	L3	CO3
OR					
Q.6	a.	Discuss the difference between : (i) Big-Bang versus Incremental testing. (ii) Bottom up versus Top-down testing.	10	L2	CO3
	b.	A Global taxi service serves it's clients. The taxi fares are calculated as follows : - Minimum fare : Rs.250/- . This covers 2 kilometers distance - For any addition distance the fare is Rs.50/- per kilometer. - One suitcase : No charge ; For additional suitcase Rs.50/- (i) Show the flowchart and program flow graph module. (ii) Express the cyclomatic complexity metric $V(G)$ in three different ways by considering, ➤ Number of Regions (R) in the graph. ➤ Number of nodes and edges (N, E) ➤ Number of decisions contained in the graph : (P) (iii) Generate Full list of paths. (iv) Generate set of independent paths to achieve full coverage.	10	L3	CO3
Module – 4					
Q.7	a.	Explain the following management components to assure software quality : (i) Project schedule control (ii) Project budget control	10	L2	CO4
	b.	Illustrate with an example the role of computerized tools for project progress control.	10	L3	CO4
OR					
Q.8	a.	Explain general and operative requirements for successful software quality metrics.	10	L2	CO4
	b.	Compare the KLOC and function points measurement for successful software quality.	10	L3	CO4
Module – 5					
Q.9	a.	Explain with the flow chart the ISO 9000-3 certification process.	10	L2	CO5
	b.	Describe the principles embodied in Capacity Maturity Model (CMM)	10	L2	CO5
OR					
Q.10	a.	Describe the IEEE/EIA 12207 software life cycle architecture.	10	L2	CO5
	b.	Explain any four underlying concepts of IEEE standard 1012.	10	L2	CO5

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