CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **BCHES102/202**

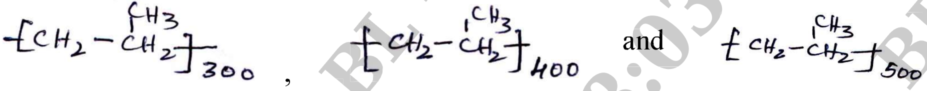
First/Second Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Applied Chemistry for CSE Stream

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 Formula Hand Book is permitted.

		Module – 1	**M**	**L**	**C**
Q.1	**a.**	What are electrochemical sensors? Explain the application in the measurement of dissolved oxygen.	**7**	**L2**	**CO2**
	b.	What are quantum dot sensitized solar cells? Explain the working principle and applications.	**7**	**L2**	**CO2**
	c.	Define Battery. Give the classification of batteries with example.	**6**	**L1**	**CO1**
		OR			
Q.2	**a.**	Explain the construction and working of Li-ion battery and mention any two advantages.	**7**	**L2**	**CO1**
	b.	Explain the principle, working and application of conductometric sensors.	**7**	**L2**	**CO1**
	c.	What are transducers and explain about disposable sensors?	**6**	**L2**	**CO2**
		Module – 2			
Q.3	**a.**	Explain the types of organic memory devices by taking p-type and n-type semiconducting material.	**7**	**L2**	**CO1**
	b.	What are Liquid Crystals? Explain the classification of liquid crystals. Mention any two properties of liquid crystals.	**7**	**L2**	**CO1**
	c.	Define optoelectronic devices. Mention any four properties and application of OLED.	**6**	**L1**	**CO1**
		OR			
Q.4	**a.**	What are memory devices? Explain the classification of electronic memory devices with example.	**7**	**L2**	**CO1**
	b.	Discuss the working mechanism of liquid crystals in display system.	**7**	**L2**	**CO1**
	c.	Discuss the use of polyimide polymeric material for organic memory device.	**6**	**L2**	**CO4**

		Module – 3			
Q.5	**a.**	Define metallic corrosion. Describe the electrochemical theory of corrosion taking iron as an example.	**7**	**L2**	**CO4**
	b.	What are reference electrode? Explain the construction and working of calomel electrode. Mention its two applications.	**7**	**L2**	**CO4**
	c.	Explain the principle, instrumentation and working of conductometry using estimation of weak acid using strong base as an example.	**6**	**L2**	**CO3**
		OR			
Q.6	**a.**	Explain the corrosion control by anodization of aluminium and sacrifiscial anodic method for iron.	**7**	**L2**	**CO1**
	b.	Explain the construction and working of glass electrode.	**7**	**L2**	**CO3**
	c.	What is Galvanization? Explain the differential aeration corrosion by taking water line corrosion as example.	**6**	**L1** **L2**	**CO1**
		Module – 4			
Q.7	**a.**	Explain the preparation, properties and application of Kevlar.	**7**	**L2**	**CO3**
	b.	What is green fuel? Explain the construction and working of photovoltaic cell.	**7**	**L1** **L2**	**CO1**
	c.	Explain the synthesis and oxidative doping process of polyacetylene.	**6**	**L2**	**CO4**
		OR			
Q.8	**a.**	Define number average and weight average molecular weight of polymer. A polymer of polypropylene is found to have the composition  $\left[CH_2-\overset{CH_3}{CH_2}\right]_{300}$, $\left[CH_2-\overset{CH_3}{CH_2}\right]_{400}$ and $\left[CH_2-\overset{CH_3}{CH_2}\right]_{500}$ with 20%, 30% and 50% respectively in a polymer material. Calculate the number and weight average molecular mass of the polymer.	**7**	**L2**	**CO5**
	b.	What are conducting polymer? Explain the reductive doping of polyacetylene. Mention the two application of conducting polymer.	**7**	**L1** **L2**	**CO2**
	c.	What is Green Hydrogen? Explain the proton exchange membrane electrolysis. Mention its advantage.	**6**	**L1** **L2**	**CO4**
		Module – 5			
Q.9	**a.**	Discuss the role of following in recovery of metals from E-waste i) Pyrometallurgy ii) Hydrometallurgy	**7**	**L2**	**CO2**
	b.	Mention the sources of E-waste, explain the need of E-waste management.	**7**	**L1**	**CO1**
	c.	Explain the direct recycling of E-waste.	**6**	**L2**	**CO2**
		OR			
Q.10	**a.**	Explain the adverse effects of toxic materials used in manufacturing electrical and electronic products.	**7**	**L2**	**CO2**
	b.	What is E-waste? Explain the advantages of recycling and recovery of E-wastes.	**7**	**L1** **L2**	**CO2**
	c.	Explain the extraction of gold from E-wastes. Mention the advantages.	**6**	**L2**	**CO2**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **BESCK104E**

First Semester B.E/B.Tech. Degree Examination, Dec.2025/Jan.2026

Introduction to C Programming

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.	What is a Computer? With a neat diagram of computer architecture explain its components.	**8**	**L2**	**CO1**
	b.	Explain the different types of computers.	**6**	**L2**	**CO1**
	c.	How primary memory is different from secondary memory? Explain.	**6**	**L2**	**CO1**
		OR			
2	a.	Write the basic structure of 'C' program. Explain each section briefly with suitable example.	**8**	**L2**	**CO2**
	b.	Explain the basic data types in 'C' with their keyword, size and range of values.	**6**	**L2**	**CO2**
	c.	With the help of example and syntax, explain formatted input/output functions of 'C' language.	**6**	**L2**	**CO2**
		Module – 2			
3	a.	Develop a 'C' program to compute the roots of a quadratic equation by accepting the co-efficients and print the appropriate message along with the values.	**8**	**L3**	**CO2**
	b.	Define branching statements. Explain any two branching statements with syntax and suitable example.	**6**	**L2**	**CO2**
	c.	Define Operator. Explain any five operators with example.	**6**	**L2**	**CO2**
		OR			
4	a.	Differentiate between while, do-while and for loops. Explain with syntax and examples.	**8**	**L2**	**CO2**
	b.	Demonstrate the working of break and continue statement with a suitable example.	**6**	**L2**	**CO2**
	c.	Develop a 'C' program to generate Fibonacci series 0, 1, 1, 2, 3, 5, 8, 13, - - - .	**6**	**L3**	**CO2**

		Module – 3			
5	a.	What is an Array? How arrays are declared and initialized with example.	**8**	**L2**	**CO3**
	b.	Develop a 'C' function that can be called to find largest element of an integer array of size 'n'.	**6**	**L3**	**CO3**
	c.	Develop a 'C' program to search an element using binary search technique.	**6**	**L3**	**CO3**
		OR			
6	a.	Develop a 'C' program to find transpose of a matrix.	**10**	**L3**	**CO3**
	b.	Develop a 'C' program to multiply two-matrices by assuming their multiplication compatibility.	**10**	**L3**	**CO3**
		Module – 4			
7	a.	Define String. Explain any 4 string manipulation function with suitable example.	**10**	**L2**	**CO3**
	b.	Develop a 'C' program to concatenate 2 strings without using built-in function.	**10**	**L3**	**CO3**
		OR			
8	a.	What is a function? Explain different types of function for handling strings.	**8**	**L2**	**CO4**
	b.	Differentiate between call by value and call by reference using suitable examples.	**6**	**L2**	**CO4**
	c.	What is Recursion? Develop 'a' 'C' program to compute factorial of a given number using recursion.	**6**	**L3**	**CO4**
		Module – 5			
9	a.	How structure can be defined within a structure (Nested structure)? Explain with example.	**6**	**L2**	**CO5**
	b.	What is Union data structure? Explain the difference between structure and union.	**6**	**L2**	**CO5**
	c.	Implement structure to read, write and compute average–marks of the students, list the students scoring above and below the average marks for a class of N students.	**8**	**L3**	**CO5**
		OR			
10	a.	What is a Pointer? How to declare and initialize pointer? Discuss pointer arithmetic with suitable 'C' code.	**10**	**L2**	**CO5**
	b.	Develop a 'C' program to find sum, mean and standard deviation of array elements using pointers.	**10**	**L3**	**CO5**

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BETCK105I

First Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Introduction to Cyber 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 Cybercrime? How do we classify cyber crimes? Explain each one briefly.	**12**	**L2**	**CO1**
	b.	Write a note on : i) E – mail spoofing ii) Spamming iii) Password sniffing iv) Hacking.	**8**	**L2**	**CO1**
		OR			
Q.2	**a.**	How do you think cyber crime has relevance in the Extended Enterprise context? Explain.	**12**	**L2**	**CO1**
	b.	Write a note on : i) Indian Legal perspective on cyber crime ii) Computer Network Intrusion.	**8**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	With an example, explain passive and active attacks.	**8**	**L2**	**CO2**
	b.	What is Social Engineering? List and explain the classification of Social Engineering.	**12**	**L2**	**CO2**
		OR			
Q.4	**a.**	What is Cyber stalking? Explain types of stalkers. How stalking works?	**10**	**L2**	**CO2**
	b.	Explain how Botnets can be used as a fuel to cyber crime.	**10**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	What is Phishing? List and explain different ways of phishers work.	**8**	**L2**	**CO4**
	b.	Write the difference between proxy servers and an anonymizer.	**4**	**L3**	**CO3**
	c.	List and explain the different types of viruses.	**8**	**L2**	**CO3**
		OR			
Q.6	**a.**	What are DOS attacks? Explain the classification of DOS attacks. And what are the tools used to launch DOS attacks?	**10**	**L3**	**CO3**
	b.	List and explain traditional techniques of attacks on wireless networks.	**10**	**L3**	**CO3**

Module – 4					
Q.7	**a.**	What is Whaling? Explain the difference between Whaling and Spear phishing.	**10**	**L2**	**CO4**
	b.	With an example , explain the identity theft. And what are the different types of ID theft?	**10**	**L3**	**CO4**
OR					
Q.8	**a.**	What are the different techniques of ID theft? How to prevent being a victim of ID theft?	**10**	**L2**	**CO4**
	b.	With an example , explain the concept of phishing. What are the techniques used by phisher to launch phishing attacks?	**10**	**L3**	**CO4**
Module – 5					
Q.9	**a.**	Explain the importance of strong documentation in cyber forensics profession.	**10**	**L2**	**CO5**
	b.	Describe the following terms : i) Digital forensics ii) Computer forensics iii) Network forensics	**10**	**L3**	**CO5**
OR					
Q.10	**a.**	With neat diagram , explain the process model for understanding a seizure and handling of forensic evidence legal framework.	**10**	**L3**	**CO5**
	b.	List and explain phases and activities of forensics life cycle.	**10**	**L3**	**CO5**

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CBCS SCHEME

USN | | | | | | | | | |

BCHES102/202

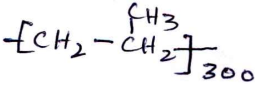
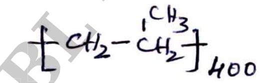
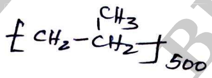
First/Second Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Applied Chemistry for CSE Stream

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 Formula Hand Book is permitted.

		Module – 1	**M**	**L**	**C**
Q.1	**a.**	What are electrochemical sensors? Explain the application in the measurement of dissolved oxygen.	**7**	**L2**	**CO2**
	b.	What are quantum dot sensitized solar cells? Explain the working principle and applications.	**7**	**L2**	**CO2**
	c.	Define Battery. Give the classification of batteries with example.	**6**	**L1**	**CO1**
		OR			
Q.2	**a.**	Explain the construction and working of Li-ion battery and mention any two advantages.	**7**	**L2**	**CO1**
	b.	Explain the principle, working and application of conductometric sensors.	**7**	**L2**	**CO1**
	c.	What are transducers and explain about disposable sensors?	**6**	**L2**	**CO2**
		Module – 2			
Q.3	**a.**	Explain the types of organic memory devices by taking p-type and n-type semiconducting material.	**7**	**L2**	**CO1**
	b.	What are Liquid Crystals? Explain the classification of liquid crystals. Mention any two properties of liquid crystals.	**7**	**L2**	**CO1**
	c.	Define optoelectronic devices. Mention any four properties and application of OLED.	**6**	**L1**	**CO1**
		OR			
Q.4	**a.**	What are memory devices? Explain the classification of electronic memory devices with example.	**7**	**L2**	**CO1**
	b.	Discuss the working mechanism of liquid crystals in display system.	**7**	**L2**	**CO1**
	c.	Discuss the use of polyimide polymeric material for organic memory device.	**6**	**L2**	**CO4**

		Module – 3			
Q.5	**a.**	Define metallic corrosion. Describe the electrochemical theory of corrosion taking iron as an example.	**7**	**L2**	**CO4**
	b.	What are reference electrode? Explain the construction and working of calomel electrode. Mention its two applications.	**7**	**L2**	**CO4**
	c.	Explain the principle, instrumentation and working of conductometry using estimation of weak acid using strong base as an example.	**6**	**L2**	**CO3**
		OR			
Q.6	**a.**	Explain the corrosion control by anodization of aluminium and sacrifiscial anodic method for iron.	**7**	**L2**	**CO1**
	b.	Explain the construction and working of glass electrode.	**7**	**L2**	**CO3**
	c.	What is Galvanization? Explain the differential aeration corrosion by taking water line corrosion as example.	**6**	**L1** **L2**	**CO1**
		Module – 4			
Q.7	**a.**	Explain the preparation, properties and application of Kevlar.	**7**	**L2**	**CO3**
	b.	What is green fuel? Explain the construction and working of photovoltaic cell.	**7**	**L1** **L2**	**CO1**
	c.	Explain the synthesis and oxidative doping process of polyacetylene.	**6**	**L2**	**CO4**
		OR			
Q.8	**a.**	Define number average and weight average molecular weight of polymer. A polymer of polypropylene is found to have the composition  $\left[CH_2-\overset{CH_3}{CH_2} \right]_{300}$,  $\left[CH_2-\overset{CH_3}{CH_2} \right]_{400}$ and  $\left[CH_2-\overset{CH_3}{CH_2} \right]_{500}$ with 20%, 30% and 50% respectively in a polymer material. Calculate the number and weight average molecular mass of the polymer.	**7**	**L2**	**CO5**
	b.	What are conducting polymer? Explain the reductive doping of polyacetylene. Mention the two application of conducting polymer.	**7**	**L1** **L2**	**CO2**
	c.	What is Green Hydrogen? Explain the proton exchange membrane electrolysis. Mention its advantage.	**6**	**L1** **L2**	**CO4**
		Module – 5			
Q.9	**a.**	Discuss the role of following in recovery of metals from E-waste i) Pyrometallurgy ii) Hydrometallurgy	**7**	**L2**	**CO2**
	b.	Mention the sources of E-waste, explain the need of E-waste management.	**7**	**L1**	**CO1**
	c.	Explain the direct recycling of E-waste.	**6**	**L2**	**CO2**
		OR			
Q.10	**a.**	Explain the adverse effects of toxic materials used in manufacturing electrical and electronic products.	**7**	**L2**	**CO2**
	b.	What is E-waste? Explain the advantages of recycling and recovery of E-wastes.	**7**	**L1** **L2**	**CO2**
	c.	Explain the extraction of gold from E-wastes. Mention the advantages.	**6**	**L2**	**CO2**

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CBCS SCHEME

USN

BCHES102/202

First/Second Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Applied Chemistry for CSE Stream

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 Formula Hand Book is permitted.

		Module – 1	**M**	**L**	**C**
Q.1	**a.**	What are electrochemical sensors? Explain the application in the measurement of dissolved oxygen.	**7**	**L2**	**CO2**
	b.	What are quantum dot sensitized solar cells? Explain the working principle and applications.	**7**	**L2**	**CO2**
	c.	Define Battery. Give the classification of batteries with example.	**6**	**L1**	**CO1**
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Q.2	**a.**	Explain the construction and working of Li-ion battery and mention any two advantages.	**7**	**L2**	**CO1**
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Q.3	**a.**	Explain the types of organic memory devices by taking p-type and n-type semiconducting material.	**7**	**L2**	**CO1**
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		Module – 3			
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	b.	What are reference electrode? Explain the construction and working of calomel electrode. Mention its two applications.	**7**	**L2**	**CO4**
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Q.6	**a.**	Explain the corrosion control by anodization of aluminium and sacrifiscial anodic method for iron.	**7**	**L2**	**CO1**
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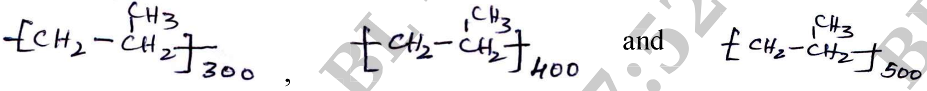
	c.	What is Galvanization? Explain the differential aeration corrosion by taking water line corrosion as example.	**6**	**L1** **L2**	**CO1**
		Module – 4			
Q.7	**a.**	Explain the preparation, properties and application of Kevlar.	**7**	**L2**	**CO3**
	b.	What is green fuel? Explain the construction and working of photovoltaic cell.	**7**	**L1** **L2**	**CO1**
	c.	Explain the synthesis and oxidative doping process of polyacetylene.	**6**	**L2**	**CO4**
		OR			
Q.8	**a.**	Define number average and weight average molecular weight of polymer. A polymer of polypropylene is found to have the composition  $-[CH_2-\overset{CH_3}{CH_2}]_{300}$, $-[CH_2-\overset{CH_3}{CH_2}]_{400}$ and $-[CH_2-\overset{CH_3}{CH_2}]_{500}$ with 20%, 30% and 50% respectively in a polymer material. Calculate the number and weight average molecular mass of the polymer.	**7**	**L2**	**CO5**
	b.	What are conducting polymer? Explain the reductive doping of polyacetylene. Mention the two application of conducting polymer.	**7**	**L1** **L2**	**CO2**
	c.	What is Green Hydrogen? Explain the proton exchange membrane electrolysis. Mention its advantage.	**6**	**L1** **L2**	**CO4**
		Module – 5			
Q.9	**a.**	Discuss the role of following in recovery of metals from E-waste i) Pyrometallurgy ii) Hydrometallurgy	**7**	**L2**	**CO2**
	b.	Mention the sources of E-waste, explain the need of E-waste management.	**7**	**L1**	**CO1**
	c.	Explain the direct recycling of E-waste.	**6**	**L2**	**CO2**
		OR			
Q.10	**a.**	Explain the adverse effects of toxic materials used in manufacturing electrical and electronic products.	**7**	**L2**	**CO2**
	b.	What is E-waste? Explain the advantages of recycling and recovery of E-wastes.	**7**	**L1** **L2**	**CO2**
	c.	Explain the extraction of gold from E-wastes. Mention the advantages.	**6**	**L2**	**CO2**

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CBCS SCHEME

USN | | | | | | | | | | |

BESCK204E

Second Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Introduction to C Programming

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 Computer. With neat block diagram, explain different components of a computer.	**10**	**L2**	**CO1**
	b.	Explain Input and Output devices.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Define Variable. Explain the rules for declaring the variables.	**6**	**L2**	**CO1**
	b.	Explain the structure of 'C' program , with an example.	**10**	**L2**	**CO1**
	c.	Write a C program to compute sum and average of three numbers.	**4**	**L3**	**CO1**
		Module – 2			
Q.3	**a.**	Explain 'If – else' conditional branching statements in C language.	**7**	**L2**	**CO2**
	b.	Explain 'for' iterative statement with example.	**7**	**L2**	**CO2**
	c.	Explain 'goto' statement with example.	**6**	**L2**	**CO2**
		OR			
Q.4	**a.**	Explain Arithmetic Operators in 'C' with example.	**6**	**L1**	**CO2**
	b.	Explain Type conversion and Type casting.	**6**	**L2**	**CO2**
	c.	Write a C program to check the given character is Lower case or Upper case or special character.	**8**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	Explain following terms with examples : i) Function declaration ii) Function definition iii) Function call.	**7**	**L2**	**CO4**
	b.	What is Function in C program? Explain needs of function.	**7**	**L2**	**CO4**
	c.	Write a C program to find factorial of a given number using recursion.	**6**	**L3**	**CO3**
		OR			

Q.6	**a.**	List the applications of arrays.	**4**	**L1**	**CO3**
	b.	Write a C program to implement matrix multiplication and validate the rules of multiplication.	**10**	**L3**	**CO3**
	c.	With syntax example, explain scan set function.	**6**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Write a C program to find the length of a given string without using inbuilt function.	**10**	**L2**	**CO3**
	b.	What is a Pointer? Show the use of two pointer operators & and *.	**10**	**L2**	**CO3**
		OR			
Q.8	**a.**	Write a C program to perform addition of two matrices.	**7**	**L3**	**CO3**
	b.	Illustrate to access elements of two dimensional arrays. Explain with example.	**7**	**L2**	**CO3**
	c.	Illustrate to pass two dimensional arrays to function. Explain with example.	**6**	**L2**	**CO3**
		Module – 5			
Q.9	**a.**	Explain the following string manipulation functions : i) Strlen ( ) ii) Strcpy ( ) iii) Strcmp ( ) iv) Strcat ( )	**8**	**L3**	**CO3**
	b.	Write a C program to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers using pointers.	**8**	**L3**	**CO4**
	c.	Explain string taxonomy with help of example.	**4**	**L2**	**CO3**
		OR			
Q.10	**a.**	Define Structure. Explain the declaration of a structure with an example.	**8**	**L2**	**CO4**
	b.	Write a C program to implement structure to read , write and compute average marks and the students scoring above and below the average marks for a class of N students.	**12**	**L3**	**CO4**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **BETCK205H**

Second Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Introduction to Internet of Things (IoT)

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 how two hosts A and B, communicate over a network using TCP/IP suite, and include a block diagram to illustrate the process.	**8**	**L2**	**CO1**
	b.	Differentiate between IoT and CPS.	**4**	**L2**	**CO1**
	c.	Discuss the various enablers of IoT and their complex interdependencies.	**8**	**L2**	**CO1**
		OR			
Q.2	**a.**	Describe the sequence of technological advancements that have contributed to the development of modern IoT.	**8**	**L2**	**CO1**
	b.	Explain various networking components of IoT.	**8**	**L2**	**CO2**
	c.	Differentiate between point to point and multipoint connection type.	**4**	**L2**	**CO2**
		Module – 2			
Q.3	**a.**	Explain the classification of sensors, based on sensor output and power requirement.	**10**	**L2**	**CO2**
	b.	List and explain the characteristics of sensors.	**5**	**L1**	**CO1**
	c.	Define Actuators. Explain in brief any 2 actuator types.	**5**	**L1**	**CO1**
		OR			
Q.4	**a.**	With neat diagram, explain scalar and multimedia sensing techniques.	**6**	**L2**	**CO2**
	b.	Compare mechanical, soft and shape memory polymer based actuators.	**6**	**L2**	**CO2**
	c.	Define sensor node. Explain the simple sensing operation in IoT node with its functional blocks.	**8**	**L2**	**CO1**
		Module – 3			
Q.5	**a.**	Describe the data offloading strategies : Offload location and Offload decision making.	**10**	**L2**	**CO2**
	b.	Explain in brief the importance of processing in IoT.	**7**	**L2**	**CO2**
	c.	Mention the IoT Device design and selection considerations.	**3**	**L1**	**CO1**

		OR			
Q.6	**a.**	How does collaborative processing differ from remote processing?	**10**	**L2**	**CO2**
	b.	Highlight the pros and cons of onsite-processing.	**5**	**L2**	**CO1**
	c.	Differentiate between structured and unstructured data.	**5**	**L2**	**CO2**
		Module – 4			
Q.7	**a.**	Discuss various cloud service models with examples.	**8**	**L2**	**CO2**
	b.	Define cloud computing. Explain in brief the advantages of virtualization.	**6**	**L2**	**CO1**
	c.	Compare the features of Open Stock and Amazon Web Services (AWS).	**6**	**L2**	**CO2**
		OR			
Q.8	**a.**	With neat diagram, explain the components of Agricultural IoT.	**10**	**L2**	**CO2**
	b.	Discuss the Importance and metrics of Service Level Agreement (SLA) in cloud computing.	**7**	**L2**	**CO2**
	c.	What are the features of Green Cloud?	**3**	**L1**	**CO1**
		Module – 5			
Q.9	**a.**	Explain the architecture of vehicular IoT with neat diagram.	**8**	**L2**	**CO2**
	b.	Explain the advantages and risk of healthcare IoT.	**7**	**L2**	**CO2**
	c.	What are the advantages of IoT in transportation?	**5**	**L1**	**CO1**
		OR			
Q.10	**a.**	Describe the layered architecture of AmbuSen system.	**10**	**L2**	**CO2**
	b.	Define Machine Learning. List and explain the advantages and challenges of machine learning.	**7**	**L1**	**CO1**
	c.	Mention the four categories of machine learning algorithms with the diagram.	**3**	**L1**	**CO1**

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CBCS SCHEME

USN

BETCK205I

Second Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Introduction to Cyber 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 classification of Cyber Crimes.	**10**	**L2**	**CO1**
	b.	Explain the following terms related to cyber crimes: i) Internet Time Theft ii) Data Didling iii) Email Spoofing iv) Salami Attack v) Spamming	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Who are Cyber Criminals? Classify them and explain cyber defamation.	**10**	**L3**	**CO2**
	b.	Explain the following terms related to cyber crimes: i) Hacking ii) Password sniffing iii) Phishing iv) Cyber Stalking v) Software Piracy	**10**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	What is Social Engineering? Discuss Human Based Social Engineering with a suitable example.	**10**	**L3**	**CO2**
	b.	Explain the difference between passive and active attacks provide tools as example.	**10**	**L3**	**CO2**
		OR			
Q.4	**a.**	What is Cyber Stalking? Explain various types of stalkers. Explain how it works with a real life example.	**10**	**L3**	**CO1**
	b.	Explain how botnets can be used as a fuel to cybercrime with the help of a block diagram.	**10**	**L2**	**CO1**
		Module – 3			
Q.5	**a.**	What is Password Cracking? List 8 guidelines that needs to be followed to avoid password cracking.	**10**	**L1**	**CO1**
	b.	Explain the difference between Virus and Worms with two examples each.	**10**	**L2**	**CO1**

		OR			
Q.6	**a.**	What are the DOS and DDOS attacks and how to protect from DOS and DDOS attacks?	**10**	**L2**	**CO1**
	b.	What are Key Loggers? Explain different types of Key loggers and mention the advantages of using anti key loggers.	**10**	**L2**	**CO1**
		Module – 4			
Q.7	**a.**	Explain any 5 types of phishing scams used by phishers.	**10**	**L2**	**CO1**
	b.	Discuss various types of Identity Theft Techniques.	**10**	**L3**	**CO2**
		OR			
Q.8	**a.**	Discuss various types of techniques used by phishers to launch phishing attacks.	**10**	**L3**	**CO1**
	b.	Explain four types of methods used by phishers to reveal personal information on Internet.	**10**	**L2**	**CO1**
		Module – 5			
Q.9	**a.**	Explain the principles involved in the collection of digital evidence.	**08**	**L2**	**CO1**
	b.	Brief out the guidelines used for the evidence collection phase.	**06**	**L1**	**CO1**
	c.	Illustrate the model for understanding a seizme and handling of forensics evidence legal framework.	**06**	**L3**	**CO2**
		OR			
Q.10	**a.**	Write a note on Chain of Custody Concept.	**08**	**L1**	**CO1**
	b.	Discuss the need for concept of computer forensics.	**06**	**L3**	**CO2**
	c.	Briefly explain Network Forensics.	**06**	**L2**	**CO1**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

BPLCK205B

Second Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Introduction to Python Programming

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 following functions with examples: i) input ii) print iii) len iv) str	**08**	**L2**	**CO1**
	b.	Explain if and elif control statements with syntax and flowchart.	**06**	**L2**	**CO1**
	c.	Develop a program to generate Fibonacci sequence of length (N). Read N from console.	**06**	**L2**	**CO1**
		OR			
Q.2	**a.**	Explain the following with example: i) Def statement with parameters ii) Parameters and Return values	**06**	**L2**	**CO1**
	b.	How to handle exception in python with example.	**05**	**L2**	**CO1**
	c.	Explain the following with syntax and example: i) for loop ii) break iii) continue	**09**	**L3**	**CO1**
		Module – 2			
Q.3	**a.**	Explain the use of in and not in operator in list with examples.	**06**	**L2**	**CO2**
	b.	Explain Negative Indexing, Slicing, index( ), append( ), remove( ), pop( ), insert( ), and sort( ) with suitable example.	**08**	**L2**	**CO2**
	c.	Write about mutable and immutable data type in list.	**06**	**L2**	**CO2**
		OR			
Q.4	**a.**	Define Dictionary. Explain the following methods of dictionary: (i) setdefault (ii) get (iii) keys (iv) items	**10**	**L2**	**CO2**
	b.	Develop a program to read the student details like Name, USN and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Illustrate with example opening of a life with open( ) function, reading the contents of the file with read( ) and writing to files with write( ).	**10**	**L2**	**CO3**
	b.	Explain how to save variable with the shelve module.	**10**	**L2**	**CO3**

		OR			
Q.6	**a.**	Explain any 5 string methods with syntax and example.	**10**	**L3**	**CO3**
	b.	Explain how individual elements of a string are accessed. How to extract a part of string? Explain with examples.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain permanent delete and safe delete with a suitable python programming example to each.	**08**	**L2**	**CO3**
	b.	Develop a program to backing up a given folder (Folder in a current working directory) into a ZIP file by using relevant modules and suitable methods.	**06**	**L3**	**CO3**
	c.	Explain the role of Assertions in Python with a suitable program.	**06**	**L2**	**CO3**
		OR			
Q.8	**a.**	Explain the functions with examples : i) Shutil.copytree( ) ii) Shutil.move( ) iii) shutil.rmtree( )	**06**	**L3**	**CO3**
	b.	Develop a python program to traverse the current directory by listing subfolders and files.	**06**	**L2**	**CO3**
	c.	Explain the support for Logging with logging module in python.	**08**	**L2**	**CO3**
		Module – 5			
Q.9	**a.**	Explain about class and objects with an example.	**10**	**L2**	**CO4**
	b.	Explain with example about pure function and modifier.	**10**	**L2**	**CO4**
		OR			
Q.10	**a.**	Explain the methods _init_ and _str_ with suitable code example to each.	**06**	**L2**	**CO4**
	b.	Explain the program development concept ‘prototype and patch’ with suitable example.	**06**	**L2**	**CO4**
	c.	Define a function which takes two objects representing complex numbers and returns new complex number with addition of two complex numbers. Define a suitable class ‘complex’ to represent the complex number. Develop a program to read N (N >= 2) complex numbers and to compute the addition of N complex numbers.	**08**	**L3**	**CO4**

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CBCS SCHEME

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BCS/BAD/BAI/BDS301

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.

<table>
<tr><th colspan="3">Module – 1</th><th>M</th><th>L</th><th>C</th></tr>
<tr><td>Q.1</td><td>a.</td><td>A random variable X has the following probability function for various values of X.
<table>
<tr><td>X :</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>P(x) :</td><td>0</td><td>K</td><td>2k</td><td>2k</td><td>3k</td><td>k^2</td><td>$2k^2$</td><td>$7k^2 + k$</td></tr>
</table>
i) Find the value of k
ii) Evaluate $P[x < 6]$, $P[0 < x < 5]$, $P[x \geq 6]$.</td><td>6</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>Find the mean and standard deviation of Binomial distribution.</td><td>7</td><td>L2</td><td>CO2</td></tr>
<tr><td></td><td>c.</td><td>If the probability of a bad reaction from a certain injection is 0.001. Determine the probability that out of 2000 individuals more than two will get a bad reaction.</td><td>7</td><td>L3</td><td>CO2</td></tr>
<tr><th colspan="6">OR</th></tr>
<tr><td>Q.2</td><td>a.</td><td>Find K such that
$$F(x) = \begin{cases} k\,e^{-x} & , \quad 0 < x < 1 \\ 0 & , \quad \text{otherwise} \end{cases}$$
Represents a valid pdf and hence find mean of the distribution.</td><td>6</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>In a certain town the duration of a shower is exponentially distributed with mean 5 minutes. What is the probability that a shower will last for
i) 10 minutes or more ii) less than 10 minutes.</td><td>7</td><td>L3</td><td>CO2</td></tr>
<tr><td></td><td>c.</td><td>The marks of 1000 students in an examination follows a normal distribution with $\mu = 70$ and S.D = 5. Find the number of students whose marks will be
i) less than 65 ii) more than 75 iii) between 65 & 75.
Given $\phi(1) = 0.3413$.</td><td>7</td><td>L3</td><td>CO2</td></tr>
<tr><th colspan="6">Module – 2</th></tr>
<tr><td>Q.3</td><td>a.</td><td>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>$\frac{1}{4}$</td><td>$\frac{1}{8}$</td><td>$\frac{1}{8}$</td></tr>
</table>
i) Find the marginal distribution of x and y.
ii) Obtain the covariance of x and y.</td><td>6</td><td>L2</td><td>CO2</td></tr>
</table>

	b.	Find the unique fixed probability vector of $P = \begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{6} & \frac{1}{2} & \frac{1}{3} \\ 0 & \frac{2}{3} & \frac{1}{3} \end{bmatrix}$	**7**	**L2**	**CO3**
	c.	A student study habit are as follows : If he studies one night , he is 70% sure of not studying next night , on the other hand if he does not study one night , he is 60% sure not to study the next night. In the long run how often does he study?	**7**	**L3**	**CO3**
		OR			
Q.4	**a.**	Define the following : i) Probability vector ii) Regular stochastic matrix iii) Absorbing state.	**6**	**L2**	**CO3**
	b.	If X and Y are two independent random variables with the following distribution. Find the joint probability distribution of X and Y and hence find the covariance. $\begin{array}{\|c\|c\|c\|} \hline x & 1 & 2 \\ \hline f(x) & 0.7 & 0.3 \\ \hline \end{array}$ $\begin{array}{\|c\|c\|c\|c\|} \hline y & -2 & 5 & 3 \\ \hline g(y) & 0.3 & 0.5 & 0.2 \\ \hline \end{array}$	**7**	**L2**	**CO2**
	c.	Three girls A, B, C are throwing the ball to each other. A always throws the ball to B, B always throws the ball to C. C is just as likely to throw the ball to B as to C. If C was the first person to throw the ball, find the probability that after 3 throws A, B , C has the ball.	**7**	**L3**	**CO3**
		Module – 3			
Q.5	**a.**	Explain the following terms : i) Null Hypothesis ii) Type 1 and 2 error iii) Test of significance	**6**	**L1**	**CO5**
	b.	A die is thrown 9000 times and throw of 3 or 4 was observed 3240 times. Do the data indicate that an unbiased dice at 5% level of significance $Z_{0.05} = 1.96$.	**7**	**L3**	**CO4**
	c.	A random sample for 1000 workers in company has mean wage of Rs 50 per day and S.D of Rs 15. Another sample of 1500 workers from another company has mean wage of Rs 45 per day and S.D of Rs 20. Does the mean rate of wages varies between two companies at 1% level of significance.	**7**	**L3**	**CO4**
		OR			
Q.6	**a.**	Certain tubes manufactured by a company have mean life time of 800 hours and S.D of 60 hrs. Find the probability that a random sample of 16 tubes taken from the group will have a mean life time of : i) Between 790 hrs and 810 hrs ii) Less than 785 hrs iii) More than 820 hrs Given $\phi(0.67) = 0.2486$; $\phi(1) = 0.3413$; $\phi(1.33) = 0.4082$	**6**	**L3**	**CO4**

<table>
<tr><td></td><td>b.</td><td>It has been found from experience that the mean breaking strength of a particular brand of thread is 275.6 gms with standard deviation of 39.7 gms. Recently a sample of 36 pieces of thread showed a mean braking strength of 253.2 gms. Can one conclude at a significance level of 5% that the thread has become inferior?</td><td>7</td><td>L3</td><td>CO4</td></tr>
<tr><td></td><td>c.</td><td>In an elementary school examination of mean grade of 32 boys was 72 and S.D 8, while the mean grade of 36 girls was 75 and S.D 6. Test the hypothesis that the performance of girls is better than boys at 1 % ℓ.O.S.</td><td>7</td><td>L3</td><td>CO4</td></tr>
<tr><td colspan="6">Module – 4</td></tr>
<tr><td>Q.7</td><td>a.</td><td>An unknown distribution has mean 635 and S.D 1.36 samples of size 36 are drawn from this population. Find the probability that the sample mean is between 634.76 and 635.24 given $\phi(1.06) = 0.3554$.</td><td>6</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>b.</td><td>The mean and S.D of the maximum loads supported by 60 cables are 11.09 tonnes and 0.73 tonnes respectively. Find 95% C.I for mean of the maximum loads of all cables produced by the company.</td><td>7</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>c.</td><td>A certain stimulus administrated to each of the 12 patients resulted in the following change in blood pressure, 5, 2, 8, -1, 3, 0, 6 -2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure given $t_{0.05} = 2.201$ for 11 d.o.f.</td><td>7</td><td>L3</td><td>CO4</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.8</td><td>a.</td><td>Ten individuals are chosen at random from a population and their heights in inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. Test the hypothesis that the mean height of the universe is 66 inches ($t_{0.05} = 2.262$ for 9 d.o.f).</td><td>6</td><td>L3</td><td>CO4</td></tr>
<tr><td></td><td>b.</td><td>A sample of 11 rats from 9 population had an average blood viscosity of 3.92 with a S.D of 0.61. On the basis of the sample establish 95% C.I for the mean blood viscosity of the population. ($Z_{0.05} = 1.96$).</td><td>7</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>c.</td><td>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 level of significance.</td><td>7</td><td>L3</td><td>CO4</td></tr>
</table>

Module – 5

Q.9 **a.** A manufacturing company has purchased three new machines of different makes and wishes to determine whether one of them is faster than the others in producing a certain output. Five hourly production figures are observed at random from each other machine and the results are given below. Use Anova and determine whether the machines are significantly different in their mean speed ($F_{2,\,12} = 3.89$).

Observation	A_1	A_2	A_3
1	25	31	24
2	30	39	30
3	36	38	28
4	38	42	25
5	31	35	28

10 L3 CO5

b. Set up on two way Anova analysis for the following two way design results.

Varieties of fertilizers	A	B	C
W	6	5	5
X	7	5	4
Y	3	3	3
Z	8	7	4

State whether variety differences are significant at 5% level given that $F_{2,\,6} = 5.14$ and $F_{3,\,6} = 4.76$.

10 L3 CO5

OR

Q.10 **a.** Set up analysis of variance table for the following per acre production data for 3 varieties of wheat each grown on 4 plots and state if the variety differences are significant given $F_{2,\,9} = 4.26$.

Plot of land	Per acre production variety of wheat		
	A	B	C
1	6	5	5
2	7	5	4
3	3	3	3
4	8	7	4

10 L3 CO6

b. Analyse and interpret the following statistics concerning output of wheat per field obtained as a result of experiment conducted to test four varieties of wheat A, B, C, D under Latin square design given $F_{3,\,6} = 4.76$.

C_{25}	B_{23}	A_{20}	D_{20}
A_{19}	D_{19}	C_{21}	B_{18}
B_{19}	A_{14}	D_{17}	C_{20}
D_{17}	C_{20}	B_{21}	A_{15}

10 L3 CO6

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **BCS302**

Third Semester B.E/B.Tech. Degree Examination, Dec.2025/Jan.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**
1	a.	Obtain the minimum expression for the POS expression : $F(A, B, C, D) = \pi M(0, 1, 5, 7, 9, 13, 15) + d(3, 10)$.	**5**	**L2**	**CO1**
	b.	Implement the following logic function in SOP form using NOR gates. $Y = A\overline{B} + B\overline{C} + ABC$.	**5**	**L3**	**CO1**
	c.	Identify the essential prime implicants of the following functions : $F(w, x, y, z) = (0, 1, 4, 5, 6, 7, 9, 11, 14, 15)$ $F(A, B, C, D) = (0, 2, 3, 5, 7, 8, 10, 11, 14, 15)$.	**10**	**L3**	**CO1**
		OR			
2	a.	Demonstrate the positive and negative logic using AND gate.	**5**	**L2**	**CO1**
	b.	Simplify the following Boolean functions using K-map : i) $F(P, Q, R, S) = \Sigma(0, 2, 5, 7, 8, 10, 13) + d(1, 4, 15)$ ii) $F(A,B,C,D) = (\overline{A}+B+C)(\overline{A}+\overline{C}+D)(\overline{B}+C+D)$.	**10**	**L3**	**CO1**
	c.	Explain Dataflow Modeling in verilogy with an example program.	**5**	**L1**	**CO1**
		Module – 2			
3	a.	Explain the difference between combinational and sequential circuits with their block diagrams and examples.	**5**	**L2**	**CO2**
	b.	Write the verilog program to implement full adder and full subtractor circuits.	**7**	**L2**	**CO2**
	c.	Describe and explain 4 bit adder with carry look ahead.	**8**	**L3**	**CO2**
		OR			
4	a.	Implement the Boolean function : $F(A, B, C, D) = \Sigma m(1, 3, 4, 11, 12, 13, 14, 15)$ using 8 : 1 MUX.	**5**	**L3**	**CO2**
	b.	What is encoder? Design 8 : 3 encoder circuits with logic diagram and truth table and also list its applications.	**7**	**L3**	**CO2**
	c.	What is Latch? Demonstrate the working of SR flip-flop and D Flip-flop and write the characteristics table and equations.	**8**	**L3**	**CO2**

		Module – 3			
5	a.	What do you mean by an addressing mode? Explain any 5 addressing modes.	**10**	**L2**	**CO3**
	b.	Describe the Big-endian and Little-endian address assignment.	**5**	**L1**	**CO3**
	c.	A program with 5000 machine instructions needs an average of 3 basic steps to execute one instruction. Find the performance of the computer having a clock speed of 500 KHz.	**5**	**L3**	**CO3**
		OR			
6	a.	Demonstrate the Branching operations using loop to add n numbers with block diagram.	**8**	**L3**	**CO3**
	b.	Show how below expression will be executed in one address and three address processor in accumulator organization. $X = (A * B) + (C * D)$.	**7**	**L3**	**CO3**
	c.	What are Condition Code Flags? Mention the significance of the flag N, Z, V and C.	**5**	**L1**	**CO3**
		Module – 4			
7	a.	Explain memory mapped I/O and I/O interface for an input device with a diagram.	**10**	**L2**	**CO4**
	b.	Explain DMA with a neat diagram.	**10**	**L4**	**CO4**
		OR			
8	a.	Explain how to handle interrupt from multiple devices using daisy chain and priority scheme.	**10**	**L3**	**CO4**
	b.	Explain centralized and distributed Bus Arbitration approaches.	**10**	**L2**	**CO4**
		Module – 5			
9	a.	With a diagram, explain the single bus organization of the data path inside a processor.	**10**	**L2**	**CO5**
	b.	Describe the basic idea of instruction pipeline.	**10**	**L2**	**CO5**
		OR			
10	a.	Explain the process of fetching word from memory in processor.	**10**	**L4**	**CO5**
	b.	Explain the pipeline performance of a processor and pipeline stalls.	**10**	**L2**	**CO5**

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CBCS SCHEME

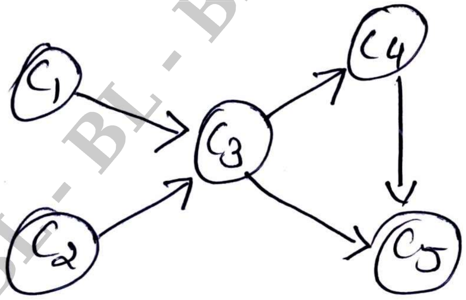
USN ☐☐☐☐☐☐☐☐☐☐ **BCS401**

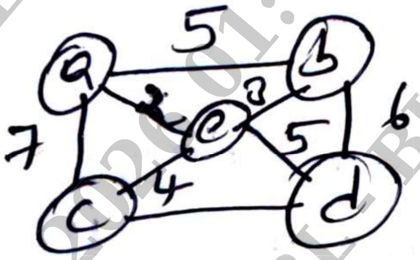
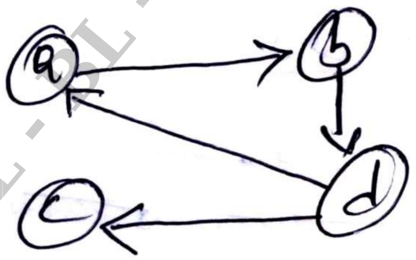
Fourth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Analysis and Design of Algorithms

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 algorithm with the help of flow chart, explain the various stages of algorithm's design and analysis process.	**10**	**L2**	**CO1**
	b.	Compare the order of 1/2 .n (n-1) and n^2.	**4**	**L3**	**CO1**
	c.	List and explain asymptotic notations used to compare the orders of growth of an algorithm, with an example each.	**6**	**L3**	**CO1**
		OR			
Q.2	**a.**	Give the general plan for analyzing the time efficiency of recursive algorithm show that efficiency of tower of Hanoi is exponential.	**10**	**L2**	**CO1**
	b.	Prove that if $t_1(n) \in 0(g_1(n))$ and $t_2(n) \in 0(g_2(n))$, then $t_1(n) + t_2(n) \in 0\{\max g_1(n), g_2(n)\}$.	**4**	**L3**	**CO1**
	c.	Solve the following recurrence $x(n) = x(n-1) + 5$ for $n > 1$, $x(1) = 0$	**6**	**L3**	**CO1**
		Module – 2			
Q.3	**a.**	Define Divide and Conquer. Design an algorithm for merge sort and sort the list "EXAMPLE" in alphabetical order using merge sort.	**10**	**L3**	**CO2**
	b.	Design an algorithm for quick sort. Sort the list 65, 70, 75, 80, 85, 60, 55, 50, 45. Also derive the worst case complexity of quick sort.	**10**	**L3**	**CO2**
		OR			
Q.4	**a.**	Define decrease and conquer technique. What are the three major variations of decrease and conquer technique? Obtain the topological ordering for the following graph. Using source removal method.  Fig.Q.4(a)	**10**	**L3**	**CO2**

	b.	Design an algorithm to sort N number of elements using insertion sort. Illustrate the tracing of insertion sort algorithm for the following set of numbers 25, 10, 72, 18, 40, 11, 64, 58, 32, 9.	**10**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	What is heap? Design an algorithm to construct a heap for the elements of the given array by bottom up approach. Show heap construction of the given list 2, 9, 7, 6, 5, 8 by successive insertion using bottom up procedure.	**10**	**L2**	**CO3**
	b.	What is AVL tree? Explain the four types of rotations used to construct the AVL tree. Construct AVL tree for the set 5, 6, 8, 3, 2, 4, 7 by successive insertion.	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	Apply Horse Pool's algorithm to search for the pattern DEMOCRATIC from the text INDIA_IS_A_DEMOCRATIC_COUNTRY. Explain its working along with a neat shift table and algorithm to find the pattern string.	**10**	**L3**	**CO3**
	b.	Design an algorithm for comparision counting sort. Apply the same to sort the list 62, 31, 84, 96, 19, 47.	**10**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Apply Kruskal's algorithm to find minimum cost spanning tree to the graph shown below source = a ;  Fig.Q.7(a)	**10**	**L3**	**CO4**
	b.	Explain the Warshall's algorithm to find the transitive closure of a directed graph. Apply it to the following graph.  Fig.Q.7(b)	**10**	**L3**	**CO4**

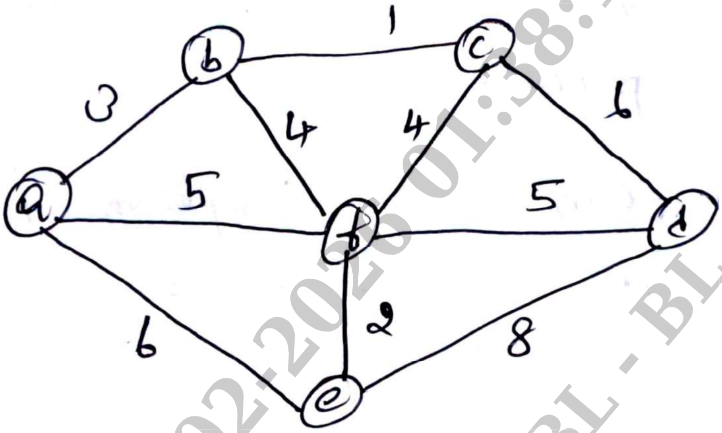
<table>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.8</td><td>a.</td><td>Construct a minimum cost spanning tree using prims algorithm for the following graph source = ‘a’.


Fig.Q.8(a)</td><td>10</td><td>L3</td><td>CO4</td></tr>
<tr><td></td><td>b.</td><td>What is Huffman Tree? Explain the algorithm to construct the Huffman tree. Construct the Huffman tree for the following data:
<table>
<tr><td>Character</td><td>A</td><td>B</td><td>C</td><td>D</td><td>-</td></tr>
<tr><td>Probability</td><td>0.35</td><td>0.1</td><td>0.2</td><td>0.2</td><td>0.15</td></tr>
</table></td><td>10</td><td>L3</td><td>CO4</td></tr>
<tr><td colspan="6">Module – 5</td></tr>
<tr><td>Q.9</td><td>a.</td><td>Using Branch and Bound technique solve the below instance of knapsack problem.
<table>
<tr><th>Item</th><th>Weight</th><th>Value</th></tr>
<tr><td>1</td><td>2</td><td>12</td></tr>
<tr><td>2</td><td>1</td><td>10</td></tr>
<tr><td>3</td><td>3</td><td>20</td></tr>
<tr><td>4</td><td>2</td><td>5</td></tr>
</table>
Capacity = 5</td><td>10</td><td>L3</td><td>CO6</td></tr>
<tr><td></td><td>b.</td><td>Define Backtracking. Apply backtracking to solve the instance of the sum of subset problem s = {3, 5, 6, 7} and d = 15.</td><td>10</td><td>L3</td><td>CO6</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.10</td><td>a.</td><td>Explain the concept of P, NP, NP – complete and NP-Hard problem.</td><td>10</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>What are Decision Trees? Explain with example, how decision trees are used in sorting algorithms.</td><td>10</td><td>L2</td><td>CO6</td></tr>
</table>

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CBCS SCHEME

BCS456C

USN

Question Paper Version : A

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.

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1. Usability is primarily concerned with,
a) Aesthetics b) Functionality
c) Ease of use d) Branding

2. In usability testing, which group of people are primarily involved?
a) Developers b) Stake holders
c) End users d) Marketing team

3. When a human user and a computer system in broad sense, get together to accomplish something. It is called as,
a) Software testing b) HCI – Human Computer Interaction
c) Software development d) Graphics Design

4. The best user experience requires a balance of,
a) Functionality b) Usability
c) Aesthetics d) All of these

5. __________ is referred as what user feels internally including the effects of usability, usefulness and emotional impact?
a) User experience b) User interface
c) User design d) User expertise

6. What does UX stand for?
a) Universal experience b) User experience
c) User expertise d) Universal expertise

7. What does UI stand for?
a) User interaction b) User Interface
c) Universal interface d) User impact

8. What does usability refer to in UX design?
a) The visual design of the product
b) The ease of use and effectiveness of the product
c) The use of animations and transitions
d) The color scheme used in the product

9. Which method for requirement extraction involves observing and interviewing users when they are in work?
a) Interviews
b) Surveys
c) Contextual inquiry
d) Card sorting

10. What is the purpose of formal requirement extraction in UI/UX design?
a) To eliminate user feedback
b) To document user needs and system functionalities
c) To prioritize aesthetics over functionality
d) To restrict the scope of the project

11. Emotional impact in user experience design refers to,
a) How user feels when they interact with a product or service
b) Gathering feedback
c) Creating empathy map
d) Conduct user research

12. User personas are created during which phase of design process,
a) Design stage
b) Discover stage
c) Development stage
d) None of these

13. What is Design Thinking?
a) It is approach to create an experience that includes emotional impact, aesthectis and social and value oriented interaction.
b) It is an approach to for collecting user requirements
c) Design of buttons and navigation bars
d) It is unnecessary in UI/UX design

14. What is the primary focus of interaction design requirement?
a) Enhancing visual appeal
b) Identifying user needs and goals
c) Maximizing technical complexity
d) Minimizing user engagement

15. Which of the following is NOT a common method for requirement extraction in UI/UX design?
a) Interviews
b) Brainstroming
c) Surveys
d) Guesswork

16. What is the purpose of creating personas as in requirement extraction?
a) to exclude user preferences
b) To represent different user groups and their characteristics
c) To prioritize aestyhetics over functionality
d) To minimize stakeholder involvement

17. Ideation means,
a) To rapidly change
b) It is a collaborative group process for forming ideas for design
c) Creating 3D model of design
d) Understanding culture of the organization

18. ___________ is rapid creation of free-hand drawings expressing preliminary design ideas.
a) Imagination b) Creativity
c) Sketching d) Ideation

19. A _________ is a conversation between the sketcher or designer and the artifact.
a) Ideation b) Design
c) UI tool d) Sketch

20. __________ is about how the system or product works within its external environment.
a) Ecological design perspective b) Interaction design perspective
c) Emotional design perspective d) Iterative design perspective

21. What is a users mental model?
a) It is a description of how the system works, as held by the user
b) It is a description of how the system works, as held by the developer
c) It is a description of how the system works, as held by the tester
d) It is a description of how the system works, as held by the marketer

22. A__________ is a sequence of visual "frames" illustrating the interplay between a user and an envisioned system.
a) Brainstroming b) Prototyping
c) Storyboard d) Wireframing

23. What is the purpose of wireframing in UI/UX design?
a) To create a final polished design b) To communicate layout and functionality
c) To select color schemes d) To add animations

24. A __________ is a representative task in which user participants are observed for their performance and behavior and take qualitative and quantitative data.
a) Conceptual design b) Horizontal task
c) Vertical task d) Benchmark task

25. Design thinking typically helps in,
a) Innovation b) Data analytics
c) Financial planning d) Operational efficiency

26. Which tool used for wireframing?
a) Microsoft visio b) Adobe InDesign
c) OmniGraffle d) All of these

27. Lunacy, Framer, Penpot, Figma are the tools used by,
a) End users b) UI designers c) Developers d) Testers

28. In UX measure, the ___________ typically refers to performance during more constant user over a longer period of time.
a) Initial performance
b) Long term performance
c) Refinability
d) Learnability

29. In UX measure, ________ means how well users will retain what they have learned over some period of time.
a) Learnability
b) Retainability
c) Initial performance
d) Long term user satisfaction

30. Which of the following is an example of usability metric?
a) Number of likes on social media post
b) Conversion rate of an e-commerce website
c) Number of colours used in the design
d) Length of the company slogan

31. ___________ is an iterative and incremental method of managing development and design.
a) Acyclic model
b) Agile methodology
c) Cyclic methodology
d) All of these

32. A ________ is used to evaluate design alternatives for particular isolated interaction details, such as behavior of an individual function or icon.
a) Depth prototype
b) Breadth prototype
c) Local prototype
d) Common prototype

33. __________ are more detailed representation of design, including details of appearance and interaction behavior.
a) High-fidelity prototype
b) Low-fidelity prototype
c) Medium-fidelity prototype
d) Local prototype

34. ____________ is very broad in the features it incorporates, but offers less depth in its coverage of functionality?
a) A horizontal prototype
b) A vertical prototype
c) A High prototype
d) A low prototype

35. Materials required for paper prototyping,
a) Blank plastic material, pens
b) Marking pens, pencils, scissors
c) Plain copier-type paper, rulers
d) All of these

36. A successful project requires both SE and UX roles to communicate?
a) Above statement is true
b) Above statement is false
c) Above statement is not related to user interface design
d) Project can be successful without communication

37. What does accessibility in UX design refer to?
a) The ability to access the internet
b) The ease of accessing the product or service
c) Ensuring that the product is available in multiple languages
d) Making the product usable for all, including people with disabilities

38. Which of the following is golden rule for interface design?
a) Place the user in control
b) Reduce the user’s memory load
c) Make the interface consistent
d) All of the mentioned

39. Which is correct sequence in SE lifecycle?
a) Analyze → Design → Implement → Test
b) Design → Analyze → Implement → Test
c) Implement → Test → Design → Analyze
d) Design → Test → Analyze → Design

40. Which is correct sequence in UX lifecycle?
a) Prototype → Analyze → Design → Evaluate prototype
b) Design → Prototype → Analyze → Evaluate prototype
c) Evaluate Prototype → Design → Analyze → Prototype
d) Analyze → Design → Prototype → Evaluate prototype

41. UX design guidelines focuses on,
a) How to create and employ windows
b) How to create button, menus
c) how to create icons, radio buttons
d) All of these are true

42. What is short term memory?
a) Concerned with in HCI and has duration of about 30 secs
b) Concerned with in HCI and has duration of about 30 mins
c) Concerned with in HCI and has duration of about 60 mins
d) Concerned with in HCI and has duration of about 120 mins

43. Information stored in short-term memory can be transferred to long term memory by,
a) Learning
b) Visualizing
c) Communicating
d) Listening

44. The ultimate goal of design thinking is to help you design better,
a) Services
b) Products
c) Experiences
d) All of these

45. Structure of interaction cycle in UX design involves,
a) Planning → Translation → Physical action → Outcome
b) Research → Analysis → Test → Design
c) Analysis → Test → Design
d) Physical action → Planning

46. Keep users aware of task progress or include progress indicators, what has been done and what is left to do?
a) It is a good design practice
b) It is a bad design practice
c) Progress indicator are not needed in UI
d) Progress indicators consumes lots of space in display screen

47. Collecting ___________ is an important portion of testing a prototype in the test stage of design thinking.
a) Pictures
b) Money
c) Feedback
d) Emails

48. Translation includes,
a) Existence b) Presentation c) Task structure d) All of these

49. Help users determine, what to do to get started?
a) It is a UX guideline b) It is not a UX guideline
c) It is a requirement of a designer d) None of these

50. Use of precise wording in labels, menu titles, menu choices, icons, data fields are necessary in UI/UX design.
a) Statement is true
b) Statement is false
c) Menu choices, icons are not related to UI
d) User can use any wording or language in UI design, complexity of wording is not a worry.

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CBCS SCHEME

USN

21CS51

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.

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.

Module-1

1 a. Define DFA. Construct DFA for the following languages:

i) L = {W : W is of even length and begin with 01}

ii) Accepts all strings on $\Sigma = \{0, 1\}$ except those containing the substring 001 **(08 Marks)**

b. Discuss the various phases of compiler with suitable example. **(06 Marks)**

c. Convert the following NFA into DFA

	0	1
→p	{p, q}	{p}
q	{r}	{r}
r	{s}	ϕ
*s	{s}	{s}

(06 Marks)

OR

2 a. Draw the table of distinguishabilities for the below DFA. Construct the minimum state equivalent DFA.

	0	1
→A	B	E
B	C	F
*C	D	H
D	E	H
E	F	I
* F	G	B
G	H	B
H	I	C
*I	A	E

(08 Marks)

b. Define ∈-closure of any state. Convert the following ∈-NFA into DFA.

	∈	a	b	c
→p	{q, r}	ϕ	{q}	{r}
q	ϕ	{p}	{r}	{p, q}
*r	ϕ	ϕ	ϕ	ϕ

(06 Marks)

Define the terms:
c. i) Alphabet
ii) String
iii) Language
iv) Empty string
v) Concatenation of strings
vi) Powers of an alphabet **(06 Marks)**

Module-2

3 a. Define regular expression. Write regular expression for the following:
i) Strings in which third symbol from the right end is ‘b’ on $\Sigma = \{a, b\}$
ii) $L = \{a^n b^m : n \geq 4 \text{ and } m \leq 3\}$
iii) $L = \{a^n b^m : n \geq 1, m \geq 1, nm \geq 3\}$ **(10 Marks)**

b. Show that the language consists of strings of a’s and b’s in which number of a’s is less than number of b’s is not regular. **(06 Marks)**

c. Discuss input buffering and sentinels. **(04 Marks)**

OR

4 a. Show that every language defined by a regular expression is also defined by a finite automata construct. $\in$-NFA for the regular expression $r = a^* + b^* + c^*$ **(10 Marks)**

b. Discuss lexemes, patterns and tokens with example. **(06 Marks)**

c. What is transition diagram? Write the transition diagram for unsigned number. **(04 Marks)**

Module-3

5 a. Define CFG. Write CFG for the following languages:
i) $L = \{0^i 1^j 0^k : j > i + k\}$
ii) $L = \{a^n b^m c^{n+m} : n, m \geq 0\}$ **(10 Marks)**

b. Write an algorithm to eliminate left recursion from the grammar. Apply the algorithm to the grammar
$S \rightarrow Aa/b$
$A \rightarrow Ac/Sd/\in$ **(06 Marks)**

c. Show that the grammar is ambiguous $S \rightarrow aS/X \quad X \rightarrow aX/a$ **(04 Marks)**

OR

6 a. Define leftmost, rightmost derivation and Parce tree. Find leftmost and rightmost derivation and construct parse tree for the string “aaabbabbba” using the grammar,
$S \rightarrow aB/bA \quad A \rightarrow a/aS/bAA \quad B \rightarrow b/bS/aBB$ **(10 Marks)**

b. Discuss the rules to compute FIRST (X) and FOLLOW (A). Construct predictive parsing table for the grammar,
$S \rightarrow iEtSS^1/a \quad S^1 \rightarrow eS/\in \quad E \rightarrow b$ **(10 Marks)**

Module-4

7 a. Construct canonical parsing table for the following grammar by constructing the collection of LR(1) items.
$S^1 \rightarrow S \quad S \rightarrow CC \quad C \rightarrow cC/d$ **(10 Marks)**

b. Construct LALR parsing table for the grammar
$S^1 \rightarrow S \quad S \rightarrow CC \quad C \rightarrow cC/d$ **(10 Marks)**

OR

8 a. Write canonical collection of sets of LR(0) items. Illustrate the actions of a shift-reduce parser on input id $*$ id
$E \rightarrow E + T / T \quad T \rightarrow T * F/F \quad F \rightarrow (E) / id$ **(10 Marks)**

b. Define NPDA. Construct NPDA for the language $L = \{WCW^R : W \in \{a, b\}^*\}$. Show the sequence of moves in accepting the string abcba **(10 Marks)**

Module-5

9 a. What are syntax directed definitions? Give SDD of a simple desk calculator. **(06 Marks)**

b. Discuss three address code with an example. **(06 Marks)**

c. Write a note on:
i) Multitape Turing Machine
ii) Recursive Language **(08 Marks)**

OR

10 a. Differentiate between S-attributed and L-attributed definitions. **(04 Marks)**

b. Discuss any three issues in the design of a code generator. **(06 Marks)**

c. Define Turing Machine. Construct Turing Machine for the language $L = \{a^n b^n c^n : n \geq 0\}$ **(10 Marks)**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **21CS52**

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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. List and explain the six service primitives that provide a simple connection-oriented service using a simple client-server interaction. **(10 Marks)**

b. Illustrate the concept of total internal reflection in an optical fiber and explain the structure of fiber cables. **(10 Marks)**

OR

2 a. Explain the operation of seven layers of an OSI reference model using diagram. **(10 Marks)**

b. Explain the electromagnetic spectrum and its uses for communication with respect to wireless transmission. **(10 Marks)**

Module-2

3 a. List the different Error-Correcting codes and Hamming code correction using suitable example. **(10 Marks)**

b. Explain Cyclic Redundancy Check (CRC) using an example. **(10 Marks)**

OR

4 a. List and explain the assumptions for Dynamic Channel Allocation. **(10 Marks)**

b. Explain Carrier Sense Multiple Access (CSMA) with Collision Detection (CD) – CSMA/CD using suitable figure. **(10 Marks)**

Module-3

5 a. Illustrate shortest path algorithm for the given network from A to D. **(08 Marks)**

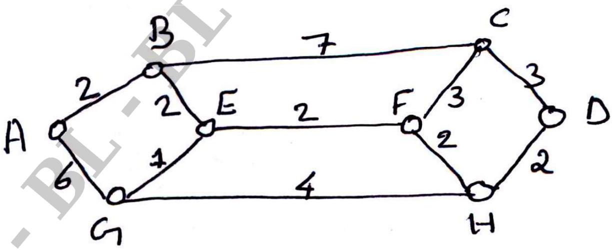

Fig.Q.5(b) Network diagram

b. Explain Distance Vector Routing using an example. Illustrate count-to-infinity problem. **(12 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. List and explain the different approaches used for congestion control. **(10 Marks)**
b. Define Traffic shaping and explain Leaky and Token Buckets using diagram. **(10 Marks)**

Module-4

7 a. Explain the steps involved in making a remote procedure call using diagram. **(08 Marks)**
b. Explain Real-Time transport protocols and packet nesting with respect to RTP. **(12 Marks)**

OR

8 a. Explain TCP header using diagram. **(10 Marks)**
b. Illustrate TCP sliding window protocol using flow diagram. **(10 Marks)**

Module-5

9 a. Explain the fields of HTTP request and response message formats using diagram. **(12 Marks)**
b. Illustrate web Caching using suitable diagram. **(08 Marks)**

OR

10 a. Illustrate the process of file transfer in an FTP protocol between local and remote file systems. **(10 Marks)**
b. Illustrate the basic operations of SMTP to transfer a simple ASCII message using suitable diagram. **(10 Marks)**

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CBCS SCHEME

BCS508

USN ☐☐☐☐☐☐☐☐☐☐

Question Paper Version : A

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.

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1. Which of the following conceptual spheres of the environment is having the least storage capacity of matter?
a) Atmosphere b) Lithosphere c) Hydrosphere d) Biosphere

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37. What does e-waste stands for
a) Environment waste b) Equipment waste
c) Electronic waste d) None of these

38. Which country producers maximum e-waste per year
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39. What is the hazardous pollutant released in LED's?
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41. What percentage of e-waste is typically recycled Globally?
a) 10% b) 20% c) 40% d) 60%

42. What is the first step in the e-waste recycling process?
a) Shredding b) Sorting c) Melting d) Crushing

43. Which component often contain valuable metals like Gold, Silver and Copper?
a) Printed circuit boards　b) Glass screens
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44. What are the health hazards which can caused by e-waste?
a) Lung cancer　b) DNA Damage　c) Brain　d) All of these

45. Where should syringe Disposed?
a) Pharma pail　b) Sharps container　c) Gray tote　d) Red pail

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48. Which one is Muncipal Solid Waste?
a) Toxic　b) Hazardous　c) Non-Toxic　d) Non-Hazardous

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* * * * *

CBCS SCHEME

BCS508

USN ☐☐☐☐☐☐☐☐☐☐

Question Paper Version : B

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
Environmental Studies and E – Waste Management

Time: 1 hr. Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

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* * * * *

CBCS SCHEME

BCS508

USN

Question Paper Version : C

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Environmental Studies and E – Waste Management

Time: 1 hr. Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

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* * * * *

CBCS SCHEME

BCS508

USN ☐☐☐☐☐☐☐☐☐☐

Question Paper Version : D

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Environmental Studies and E – Waste Management

Time: 1 hr. Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐

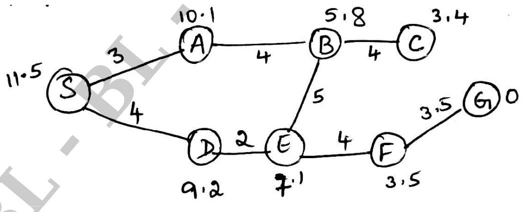
BCS515B

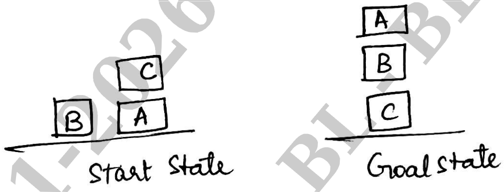
Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

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 Alan Turing's significant contribution to artificial intelligence and give a brief introduction to the Turing Test in AI.	**10**	**L2**	**CO1**
	b.	Define agent, agent function and agent program. Explain with a neat diagram how agent interacts with environment through sensors and actuators.	**10**	**L1**	**CO1**
		OR			
Q.2	**a.**	List the types of Agents. Explain Goal Based and utility based agent with neat diagram.	**10**	**L2**	**CO1**
	b.	Compare and contrast between i) Deterministic and Stochastic ii) Static and Dynamic iii) Episodic and Sequential iv) Fully observable and partially observable. Give example for each of the nature of environment given above.	**10**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Explain the tree search and graph search algorithms.	**10**	**L2**	**CO2**
	b.	Explain problems solving agents along with algorithm and illustrate the incremental formulation of 8-Queens problem.	**10**	**L2**	**CO2**
		OR			
Q.4	**a.**	List and explain the criteria to measure the performance of search strategies.	**10**	**L2**	**CO2**
	b.	Explain Breadth first search technique as a problem solving strategy with its benefits and shortcomings.	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Explain A^* algorithm for shortest path and apply the same for the below graph.  Fig Q5(a)	**10**	**L3**	**CO3**

<table>
<tr><td></td><td>b.</td><td>Apply heuristic search algorithm on the given 8 puzzle problem to reach the goal state from the initial state
<table><tr><td>1</td><td>2</td><td>3</td></tr><tr><td></td><td>4</td><td>6</td></tr><tr><td>7</td><td>5</td><td>8</td></tr></table>
Start state
<table><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>4</td><td>5</td><td>6</td></tr><tr><td>7</td><td>8</td><td></td></tr></table>
Goal state</td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.6</td><td>a.</td><td>Define knowledge based agent. Outline the knowledge based agent program.</td><td>10</td><td>L1</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>Define Propositional Logic. Explain syntax and semantics.</td><td>10</td><td>L1</td><td>CO3</td></tr>
<tr><td colspan="6">Module – 4</td></tr>
<tr><td>Q.7</td><td>a.</td><td>Explain first order logic with its syntax in BNF form.</td><td>10</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>b.</td><td>Explain Quantifiers. Differentiate between Universal and Existential Quantifier.</td><td>10</td><td>L2</td><td>CO4</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.8</td><td>a.</td><td>Illustrate Kinship Domain with an example.</td><td>10</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>b.</td><td>Illustrate unification algorithm used for reasoning with example.</td><td>10</td><td>L2</td><td>CO4</td></tr>
<tr><td colspan="6">Module – 5</td></tr>
<tr><td>Q.9</td><td>a.</td><td>Outline the backward chaining algorithm for definite clauses. Construct a proof tree to prove that “west is a criminal”.</td><td>10</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>Apply Resolution for “west is a criminal” and “curiosity killed the cat” example.</td><td>10</td><td>L3</td><td>CO5</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.10</td><td>a.</td><td>Define Planning. Explain block world problem for the following start state and End state.

</td><td>10</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>Illustrate how planning graph data structure can be used to give a better heuristic for a planning problem.</td><td>10</td><td>L2</td><td>CO5</td></tr>
</table>

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CBCS SCHEME

USN | | | | | | | | | | | **BRMK557**

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Research Methodology and IPR

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 the term Research. Explain the research flow cycle with the help of a neat diagram.	**07**	**L2**	**CO1**
	b.	Interpret the factors that motivate Engineering Research.	**07**	**L2**	**CO1**
	c.	With the help of neat diagram, recall the 3 broad categories of developing and accessing knowledge in research.	**06**	**L1**	**CO1**
		OR			
Q.2	**a.**	What do you mean by Ethics? Recall the importance of practicing ethics in engineering research.	**07**	**L1**	**CO1**
	b.	Write short notes on the following : i) Fabrication ii) Plagiarism	**08**	**L2**	**CO1**
	c.	Explain in brief the 3 ways to credit the Research Contributions.	**05**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Explain briefly the goals of conducting literature review in academic research.	**10**	**L2**	**CO2**
	b.	Explain how existing knowledge will act as a foundation for new knowledge.	**10**	**L2**	**CO2**
		OR			
Q.4	**a.**	Define Citation. Mention and explain the types of citations which fail to achieve their goals in benefiting the reader.	**10**	**L2**	**CO2**
	b.	With the help of neat diagram, illustrate how knowledge flows through a citation network.	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	What is Intellectual Property? Discuss the role of IP in economic and cultural development of the society.	**10**	**L2**	**CO1**
	b.	List the type of inventions which are eligible for patenting and which are not patentable?	**10**	**L1**	**CO3**

OR					
Q.6	**a.**	Define the term Patent. List and explain the conditions that must be met for obtaining a patent protection.	**10**	**L2**	**CO3**
	b.	With the help of neat diagram, explain the process of patenting an invention.	**10**	**L2**	**CO3**
Module – 4					
Q.7	**a.**	What is Copy Right? Explain the criteria that a work must meet to qualify for Copy Right Protection.	**10**	**L2**	**CO4**
	b.	With the help of flowchart, explain the important steps involved in the process of copy right registration.	**10**	**L2**	**CO4**
OR					
Q.8	**a.**	What is a Trademark? Explain eligibility criterias for trademark and designation of Trademark Symbols.	**10**	**L2**	**CO4**
	b.	With the help of neat flowchart, explain the process of trademark registration.	**10**	**L2**	**CO4**
Module – 5					
Q.9	**a.**	What is an Industrial Design? Explain the procedure for registering an industrial design.	**10**	**L2**	**CO5**
	b.	Explain the classification of Industrial Design.	**10**	**L2**	**CO5**
OR					
Q.10	**a.**	What is GI? Explain the mechanism available for the protection of rights related to GI.	**10**	**L2**	**CO5**
	b.	Discuss the case study of curcuma (turmeric) patent.	**10**	**L2**	**CO5**

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CBCS SCHEME

USN | BTE755C

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Embedded Systems 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.**	Explain the general features and characteristics that distinguish embedded systems from general purpose computers.	**10**	**L2**	**CO1**
	b.	Describe the difference between a Microprocessor Unit (MPU) and a Microcontroller Unit (MPU) with examples.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Discuss the significance of low power dissipation in embedded system and how it is achieved.	**10**	**L2**	**CO1**
	b.	Classify embedded systems based on MCU data word lengths and give example for each category.	**10**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Explain the architectural differences between Von-Neumann and Harvard Architecture in microcontrollers and their impact on performance.	**10**	**L2**	**CO2**
	b.	What is RAM? What is static RAM? Explain the working of one bit SRAM cell with a neat diagram.	**10**	**L2**	**CO2**
		OR			
Q.4	**a.**	Discuss the main strategies used to design low power embedded systems and the importance of power management.	**10**	**L2**	**CO2**
	b.	Explain the purpose of pull up and pull down resistors in digital circuits and their role in microcontroller input pins.	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Explain the working principle of a thermistor and how it can be used as a temperature sensor in embedded systems.	**10**	**L2**	**CO3**
	b.	Describe the types of light sensors commonly used in embedded systems and their typical applications.	**10**	**L2**	**CO3**

		OR			
Q.6	**a.**	Explain static and dynamic seven segment LED displays and their differences in power consumption and operation.	**10**	**L2**	**CO3**
	b.	Discuss the principle of stepper motors and the different driving methods used for controlling their rotation.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the basic functional blocks of a mobile phone. Draw and label the block diagram of a mobile phone receiver.	**10**	**L2**	**CO4**
	b.	Describe the concept of frequency reuse in cellular networks and discuss how co-channel interference is mitigated. Draw a diagram illustrating frequency reuse with hexagonal cells.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain the working of an Antilock Braking System (ABS) in automobiles. Mention the key components. Draw the block diagram of the ABS system.	**10**	**L2**	**CO4**
	b.	Define a Brain Machine Interface (BMI) and describe its main stages. Draw a block diagram of a BMI system.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the concept of a systems perspective in embedded design. How does perspective help in understanding complex products?	**10**	**L2**	**CO5**
	b.	Outline the step by step procedure for product design starting from need identification to hardware software and mechanical design. Draw a block diagram summarizing this process.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Discuss the importance of ergonomic design in product development. What role do anthropometric measurements play? Provide examples where ergonomic design is critical.	**10**	**L2**	**CO5**
	b.	Describe the PCB design process from schematic symbol creation to routing and layers. Why is proper component placement important? Illustrate with a block flow diagram of PCB design steps.	**10**	**L2**	**CO5**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **21CS61**

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Software Engineering and Project Management

Time: 3 hrs. Max. Marks: 100

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

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.

Module-1

1 a. What is Software Engineering? Explain the software engineering practice in detail. **(06 Marks)**

b. Define software Myth. Demonstrate customer myth and practitioners myth in detail. **(07 Marks)**

c. Elaborate on incremental model along with its advantages and disadvantages. **(07 Marks)**

OR

2 a. Identify the model which is well suited for the below scenario and explain in detail. The SBI Bank Manager gives requirements to develop SBI banking application. The manager states that the requirements are stable and changes are not required in future. **(08 Marks)**

b. Show the process flow in spiral model along with neat diagram. **(06 Marks)**

c. Discuss the common attributes or characteristics for Web App. **(06 Marks)**

Module-2

3 a. Draw a use case diagram which demonstrates the usage of library management system. **(08 Marks)**

b. Identify the differences between user and system requirements. **(06 Marks)**

c. Discuss on activity diagram in detail. **(06 Marks)**

OR

4 a. Construct a use case diagram for online shopping system. **(08 Marks)**

b. Explain each and every step in requirements elicitation. **(06 Marks)**

c. Elaborate on state transition diagram briefly. **(06 Marks)**

Module-3

5 a. Write short notes on tool set of agile process. **(07 Marks)**

b. Brief the scrum concept along with scrum roles and events. **(07 Marks)**

c. Identify the core principles in software engineering and explain them in detail. **(06 Marks)**

OR

6 a. Discuss on extreme programming along with the Xp rules. **(07 Marks)**

b. What is Agility? Explain the cost of curve in agile. **(07 Marks)**

c. Explain Agile principles in detail **(06 Marks)**

Module-4

7 a. Explain the characteristics of the project. **(06 Marks)**

b. Discuss the different ways of categorizing software project. **(07 Marks)**

c. Elaborate on software project v/s other engineering projects. **(07 Marks)**

OR

8 a. Discuss criteria's and factors of a project success and project failure. **(07 Marks)**

b. Differentiate between traditional v's modern project management practices. **(06 Marks)**

c. Explain different phases of project management life cycle. **(07 Marks)**

Module-5

9 a. Explain software quality dimensions/parameters and factors affecting software quality. **(07 Marks)**

b. With a neat diagram, explain place of software quality in project management. **(07 Marks)**

c. Discuss on techniques that enhances software quality. **(06 Marks)**

OR

10 a. Demonstrate the usage of Mecall Software quality model. **(06 Marks)**

b. Elaborate on Capability Maturity Model (CMM) in detail. **(07 Marks)**

c. Explain levels of testing and testing activities. **(07 Marks)**

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CBCS SCHEME

USN

BCS654B

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.

<table>
<tr><th colspan="3">Module – 1</th><th>M</th><th>L</th><th>C</th></tr>
<tr><td>Q.1</td><td>a.</td><td>Define Operating System. Explain modern computer system with suitable block diagram.</td><td>10</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>Discuss various services provided by operating system.</td><td>10</td><td>L2</td><td>CO1</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.2</td><td>a.</td><td>Explain multiprogramming, multiprocessing and multitasking.</td><td>10</td><td>L2</td><td>CO1</td></tr>
<tr><td></td><td>b.</td><td>What is a System Call? Explain different types of system calls.</td><td>10</td><td>L2</td><td>CO1</td></tr>
<tr><td colspan="6">Module – 2</td></tr>
<tr><td>Q.3</td><td>a.</td><td>Define a Process. Explain various states of a process with its diagram.</td><td>10</td><td>L2</td><td>CO2</td></tr>
<tr><td></td><td>b.</td><td>Discuss different types of CPU schedulers.</td><td>10</td><td>L2</td><td>CO2</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.4</td><td>a.</td><td>Define Thread. Explain the benefits of multithreaded programming.</td><td>10</td><td>L2</td><td>CO2</td></tr>
<tr><td></td><td>b.</td><td>Discuss different multithreading models.</td><td>10</td><td>L2</td><td>CO2</td></tr>
<tr><td colspan="6">Module – 3</td></tr>
<tr><td>Q.5</td><td>a.</td><td>List CPU scheduling criteria. Explain with an example.</td><td>10</td><td>L2</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>Apply FCFS and scheduling algorithm for the given problem and calculate Average Waiting Time and Average Turnaround time.
<table>
<tr><th>Process ID</th><th>Arrival Time</th><th>Burst Time</th></tr>
<tr><td>P1</td><td>2</td><td>2</td></tr>
<tr><td>P2</td><td>5</td><td>6</td></tr>
<tr><td>P3</td><td>0</td><td>4</td></tr>
<tr><td>P4</td><td>0</td><td>7</td></tr>
<tr><td>P5</td><td>7</td><td>4</td></tr>
</table></td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.6</td><td>a.</td><td>Define critical section problem. Explain with a suitable diagram.</td><td>5</td><td>L2</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>Write and explain Peterson's solution by taking an example.</td><td>10</td><td>L2</td><td>CO3</td></tr>
<tr><td></td><td>c.</td><td>Explain how semaphores can be used to solve dining Philosopher's problem.</td><td>5</td><td>L2</td><td>CO3</td></tr>
</table>

Module – 4

Q.7 **a.** What is a Deadlock? List and explain necessary conditions for deadlock situation. **10** **L2** **CO4**

b. Consider the following snapshot of the system – Apply Bankers safety algorithm. **10** **L3** **CO4**

	Allocation Matrix				Max Matrix		
	A	B	C		A	B	C
P0	1	0	1	P0	2	1	1
P1	2	1	2	P1	5	4	4
P2	3	0	0	P2	3	1	1
P3	1	0	1	P3	1	1	1

Available Matrix

A	B	C
2	1	1

i. Calculate need matrix
ii. Is the system in safe state? If so mention safe sequence.

OR

Q.8 **a.** What are First-Fit, Best-Fit and Worst-Fit in memory allocation? Explain with suitable example. **10** **L2** **CO4**

b. Why Paging? Explain paging hardware with its block diagram. **10** **L2** **CO4**

Module – 5

Q.9 **a.** What is a page fault? Explain steps involved in handling page fault. **10** **L2** **CO5**

b. Consider the page reference string 7, 0, 1, 2, 0, 3, 0, 4, 2, 3 for a memory with frame size 3. Determine the page faults using FIFO algorithm. **10** **L3** **CO5**
i. Calculate Hit ratio
ii. Calculate Miss ratio.

OR

Q.10 **a.** Define File. List and explain file attributes. **5** **L2** **CO5**

b. Explain various operations on File. **10** **L2** **CO5**

c. Write a note on file access methods. **5** **L2** **CO5**

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CBCS SCHEME

USN | | | | | | | | | | |

BCS701

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.**	Explain the characteristics and applications of IoT.	**10**	**L2**	**CO1**
	b.	List and explain the various IoT enabling technologies.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	What is IoT? Explain the generic block diagram of an IoT device.	**10**	**L2**	**CO1**
	b.	Describe the components of an IoT system and explain the IoT level-1 system with a diagram.	**10**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Describe the M2M system architecture and M2M gateway with block diagrams.	**10**	**L2**	**CO2**
	b.	Explain the need for IoT system management.	**10**	**L2**	**CO2**
		OR			
Q.4	**a.**	Discuss the differences between M2M and IoT systems.	**10**	**L3**	**CO2**
	b.	Describe the IoT system management with NETCONF-YANG with a diagram.	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Explain the steps involved in IoT system design methodology with a diagram.	**10**	**L2**	**CO3**
	b.	Explain the following python data types with examples: i) Numbers ii) Strings iii) Lists iv) Tuples v) Dictionaries	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Explain the IoT system for weather monitoring.	**10**	**L2**	**CO3**
	b.	With a program, describe the File Handling functionality of python to read and write using file object.	**10**	**L2**	**CO3**

		Module – 4			
Q.7	**a.**	Explain the various components and peripherals of the Rasberry Pi board.	**10**	**L2**	**CO4**
	b.	Write a python program for switching LED based on reading LDR (Light Sensor) reading.	**10**	**L3**	**CO4**
		OR			
Q.8	**a.**	Describe the Home Intrusion Detection system using IoT.	**10**	**L3**	**CO4**
	b.	Explain the smart parking IoT system.	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the components of Hadoop cluster and Hadoop MapReduce Job Execution.	**10**	**L2**	**CO5**
	b.	Write a short note on Apache Storm Framework.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Describe how Hadoop MapReduce for Batch Data Analysis with a diagram.	**10**	**L2**	**CO5**
	b.	Explain the key components of Hadoop YARN and its job execution framework.	**10**	**L2**	**CO5**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **BCS702**

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.**	Explain in detail the classification of parallel computers according to Flynn's taxonomy. Compare SIMD and MIMD systems.	**10**	**L1**	**CO1**
	b.	Discuss shared memory and distributed memory architectures. Explain their working principle advantages and disadvantages.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	What is cache coherence? Explain snooping and directory based coherence mechanisms with suitable example.	**10**	**L3**	**CO1**
	b.	Explain non-determinism and race conditions in shared memory programs. How can they be avoided?	**10**	**L3**	**CO1**
		Module – 2			
Q.3	**a.**	Explain GPU programming in detail.	**10**	**L2**	**CO2**
	b.	Describe input and output handling in MIMD and GPU systems.	**10**	**L2**	**CO2**
		OR			
Q.4	**a.**	Explain Amdahl's law with example and discuss it significance.	**10**	**L3**	**CO2**
	b.	Write a short note on timing and performance measurement of parallel programs.	**10**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	Define and explain the following MPI functions with syntax and purpose : i) MPI_Init( ) ii) MPI_Finalize( ) iii) MPI_Comm_Size( ) iv) MPI_Comm_rank( )	**10**	**L3**	**CO3**
	b.	Explain the concept of point to point communication in MPI with suitable example.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Explain the working of trapezoidal rule program in MPI.	**10**	**L3**	**CO3**
	b.	Compare the traditional global sum using process 0 as collector with tree structured global sum.	**10**	**L3**	**CO3**

		Module – 4			
Q.7	**a.**	Explain the structure and working of an OpenMP “Hello world” program.	**6**	**L2**	**CO4**
	b.	Explain the purpose of the reduction clause in OpenMP with example.	**6**	**L2**	**CO4**
	c.	Write a OpenMP program to calculate n-Fibonacci using tasks.	**8**	**L2**	**CO4**
		OR			
Q.8	**a.**	Define OpenMP. Explain the key features of OpenMP and its advantages over Pthreads.	**6**	**L1**	**CO4**
	b.	Explain the concept of variable scope in OpenMP with suitable example.	**6**	**L2**	**CO4**
	c.	Estimate the value of π.	**8**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Define GPU and GPGPU. Explain the need for GPGPU.	**6**	**L1**	**CO5**
	b.	Explain thread, block and grid in CUDA.	**6**	**L2**	**CO5**
	c.	Explain CUDA vector addition program with suitable example.	**8**	**L3**	**CO5**
		OR			
Q.10	**a.**	Compare CUDA and OpenCL.	**6**	**L1**	**CO5**
	b.	Explain Kernel with shared memory.	**6**	**L2**	**CO5**
	c.	Explain Heterogeneous computing in detail.	**8**	**L3**	**CO5**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **BCS703**

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.**	Obtain Ciphertext for the given plaintext "HILLCIPHER" by applying the Hill Cipher technique using key K = $\begin{bmatrix} 03 & 02 \\ 08 & 05 \end{bmatrix}$	**7**	**L3**	**CO1**
	b.	Write a short note on Steganography and its advantages and disadvantages.	**6**	**L2**	**CO1**
	c.	With a neat diagram, explain the model for network security.	**7**	**L2**	**CO1**
		OR			
Q.2	**a.**	State the rules used for encryption in PLAYFAIR cipher and encrypt the message "COMPUTER" using the keyword "ENGINEERING" using PLAYFAIR cipher.	**7**	**L3**	**CO1**
	b.	Describe simple XOR and one – time pad encryption techniques with an example and their difficulties.	**7**	**L2**	**CO1**
	c.	With a block diagram, explain the various steps involved in encryption and key generation of the DES algorithm.	**6**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Demonstrate the Diffie – Hellman key exchange algorithm.	**8**	**L2**	**CO2**
	b.	Perform encryption and decryption using the RSA algorithm given public key is 6 for two prime numbers 17 and 31 with message 3.	**7**	**L3**	**CO2**
	c.	Describe the fundamental requirements that a public key cryptosystem must meet to ensure security.	**5**	**L2**	**CO2**
		OR			
Q.4	**a.**	Explain briefly the elliptic curve cryptography and mention two applications.	**8**	**L2**	**CO2**
	b.	Let q = 719 and g = 5 , Xa = 157 , Xb = 293. Use the Diffie Hellman Key exchange algorithm to find Ya , Yb and Secret key K.	**7**	**L3**	**CO2**
	c.	Briefly explain the security aspects of the RSA algorithm.	**5**	**L2**	**CO2**

		Module – 3			
Q.5	**a.**	Explain the symmetric key distribution using Asymmetric Encryption.	**7**	**L2**	**CO3**
	b.	Explain the role of cryptographic hash functions in message authentication with a neat diagram.	**8**	**L2**	**CO3**
	c.	Discuss the general elements of an X.509 certificate.	**5**	**L2**	**CO3**
		OR			
Q.6	**a.**	What is Key Management? Explain with a neat diagram, how key usage can be controlled in encryption and decryption using control vectors.	**7**	**L2**	**CO3**
	b.	Describe the architecture of the Public Key Infrastructure X.509 (PKIX) model with a neat diagram.	**8**	**L2**	**CO3**
	c.	Write a short note on the various schemes of public key distribution.	**5**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain functions and cryptographic algorithms used in S/MIME functionality.	**8**	**L2**	**CO4**
	b.	Define TLS and explain its architecture with a neat diagram.	**7**	**L2**	**CO4**
	c.	Bring out the differences between Kerberos version 4 and version 5.	**5**	**L2**	**CO4**
		OR			
Q.8	**a.**	Describe remote user authentication using asymmetric encryption.	**8**	**L2**	**CO4**
	b.	Explain Pretty Good Privacy (PGP) message transmission and reception with a neat diagram.	**7**	**L2**	**CO4**
	c.	Elaborate on the various security approaches that address web security threats.	**5**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	How does Domain Keys Identified Mail (DKIM) address the threats posed by email attackers and what is its strategy for email authentication?	**8**	**L2**	**CO5**
	b.	Explain Internet Key Exchange (IKE) key determination features.	**7**	**L2**	**CO5**
	c.	Explain Basic combinations of Security Associations.	**5**	**L2**	**CO5**
		OR			
Q.10	**a.**	Illustrate the key components of the Internet mail architecture with a clear diagram.	**8**	**L2**	**CO5**
	b.	Explain the Encapsulating IP Security Payload.	**7**	**L2**	**CO5**
	c.	Describe the functional flow of Domain Keys Identified Mail (DKIM).	**5**	**L2**	**CO5**

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BCS755C

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.**	Explain the different activities of a generic process framework for software engineering.	**10**	**L2**	**CO1**
	b.	With necessary sketches, explain two common evolutionary process models.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Write a short note on following specialized process model. i) Component Based Development ii) Formal Method Model	**10**	**L2**	**CO1**
	b.	With a neat diagram explain unified process with its different phases.	**10**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Define requirement engineering. Why it is necessary? Explain seven distinct tasks of requirement engineering.	**10**	**L2**	**CO2**
	b.	Develop a use-can template description for safe home system considering home owner as a primary Stake-holder.	**10**	**L3**	**CO2**
		OR			
Q.4	**a.**	Develop following UML diagrams for access camera surveillance via the internet display camera view function : i) Activity diagram ii) Swimlane diagram	**10**	**L3**	**CO2**
	b.	With suitable examples, explain the data modeling concepts covering data objects, data attributes and relationships.	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Define twelve agility principles for those who want to achieve agility.	**10**	**L2**	**CO3**
	b.	With a neat diagram, explain extreme programming process.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Write a short note on: i) Scrum ii) Feature Driven Development (FDD)	**10**	**L2**	**CO3**
	b.	Explain the different principles that guide each frame work activity.	**10**	**L2**	**CO3**

		Module – 4			
Q.7	**a.**	With a help of a neat diagram explain translating the requirements model into design model.	**10**	**L2**	**CO4**
	b.	Briefly explain quality guidelines and quality attributes with respect to design process.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Briefly explain the taxonomy of architecture styles.	**10**	**L2**	**CO4**
	b.	Explain the generic structure of architectural context diagram. Also illustrate context diagram for the "Safe Home Security Function".	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Write a short note on: i) Garvin's Quality Dimensions ii) Mc.Call's Duality Factors Features	**10**	**L2**	**CO5**
	b.	Explain a reference model for a technical reviews.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the different object oriented testing strategies.	**10**	**L2**	**CO5**
	b.	In detail explain the control structure testing.	**10**	**L2**	**CO5**

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BTE755C

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

Embedded Systems 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.**	Explain the general features and characteristics that distinguish embedded systems from general purpose computers.	**10**	**L2**	**CO1**
	b.	Describe the difference between a Microprocessor Unit (MPU) and a Microcontroller Unit (MPU) with examples.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Discuss the significance of low power dissipation in embedded system and how it is achieved.	**10**	**L2**	**CO1**
	b.	Classify embedded systems based on MCU data word lengths and give example for each category.	**10**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Explain the architectural differences between Von-Neumann and Harvard Architecture in microcontrollers and their impact on performance.	**10**	**L2**	**CO2**
	b.	What is RAM? What is static RAM? Explain the working of one bit SRAM cell with a neat diagram.	**10**	**L2**	**CO2**
		OR			
Q.4	**a.**	Discuss the main strategies used to design low power embedded systems and the importance of power management.	**10**	**L2**	**CO2**
	b.	Explain the purpose of pull up and pull down resistors in digital circuits and their role in microcontroller input pins.	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Explain the working principle of a thermistor and how it can be used as a temperature sensor in embedded systems.	**10**	**L2**	**CO3**
	b.	Describe the types of light sensors commonly used in embedded systems and their typical applications.	**10**	**L2**	**CO3**

		OR			
Q.6	**a.**	Explain static and dynamic seven segment LED displays and their differences in power consumption and operation.	**10**	**L2**	**CO3**
	b.	Discuss the principle of stepper motors and the different driving methods used for controlling their rotation.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the basic functional blocks of a mobile phone. Draw and label the block diagram of a mobile phone receiver.	**10**	**L2**	**CO4**
	b.	Describe the concept of frequency reuse in cellular networks and discuss how co-channel interference is mitigated. Draw a diagram illustrating frequency reuse with hexagonal cells.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain the working of an Antilock Braking System (ABS) in automobiles. Mention the key components. Draw the block diagram of the ABS system.	**10**	**L2**	**CO4**
	b.	Define a Brain Machine Interface (BMI) and describe its main stages. Draw a block diagram of a BMI system.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the concept of a systems perspective in embedded design. How does perspective help in understanding complex products?	**10**	**L2**	**CO5**
	b.	Outline the step by step procedure for product design starting from need identification to hardware software and mechanical design. Draw a block diagram summarizing this process.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Discuss the importance of ergonomic design in product development. What role do anthropometric measurements play? Provide examples where ergonomic design is critical.	**10**	**L2**	**CO5**
	b.	Describe the PCB design process from schematic symbol creation to routing and layers. Why is proper component placement important? Illustrate with a block flow diagram of PCB design steps.	**10**	**L2**	**CO5**

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Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.**	Describe the 3 V's of Big Data and discuss the challenges faced with Big data.	**10**	**L2**	**CO1**
	b.	Explain the classification of digital data.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Discuss Big Data Analytics and explain the following terminologies : i) Symmetric Multiprocessor System ii) CAP Theorem.	**10**	**L2**	**CO1**
	b.	Explain the features and advantages and NOSQL. Discuss the types of NOSQL data bases.	**10**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Discuss the need for Hadoop and its high level architecture.	**10**	**L2**	**CO2**
	b.	Illustrate MapReduce process with a word count example.	**10**	**L3**	**CO2**
		OR			
Q.4	**a.**	Discuss the limitation of HDFS and its solution. Explain the YARN architecture.	**10**	**L3**	**CO2**
	b.	Implement a MapReduce program in Java/Python/R to implement matrix multiplication.	**10**	**L4**	**CO2**
		Module – 3			
Q.5	**a.**	Discuss replication and Sharding in MongoDB.	**10**	**L2**	**CO3**
	b.	Illustrate the CRUD operations using MongoDB query language with examples.	**10**	**L3**	**CO3**
		OR			
Q.6	**a.**	Demonstrate the following operations in MongoDB query language with examples : i) Count ii) Limit iii) Sort iv) Skip.	**10**	**L2**	**CO3**
	b.	Explain the application of the following in MongoDB i) Cursors ii) Indexes iii) MongoExport iv) Aggregate function.	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Discuss the features of Hive. Explain the Hive architecture.	**10**	**L2**	**CO3**
	b.	Explain the DDL and DML commands in Hive.	**10**	**L2**	**CO3**
		OR			
Q.8	**a.**	Express the features and philosophy of Pig. Discuss ETL processing.	**10**	**L2**	**CO3**
	b.	Discuss the following in Pig. i. Relational operators – Foreach and Limit ii. Complex data types – Tuple and Map.	**10**	**L2**	**CO3**
		Module – 5			
Q.9	**a.**	Discuss the features of spark. Explain the spark software stack.	**10**	**L2**	**CO4**
	b.	Explain the steps involved between acquisition of data from multiple sources and its application in spark.	**10**	**L2**	**CO4**
		OR			
Q.10	**a.**	Discuss text mining and its applications. Explain the process of text minng.	**10**	**L2**	**CO4**
	b.	Implement a word count program in Hadoop and spark using Java/Python/R.	**10**	**L4**	**CO4**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **BCA701**

Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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 briefly the benefits of neural networks.	**10**	**L1**	**CO1**
	b.	Explain the role of weights, bias and activation functions in a neuron model.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	State and explain Perceptron Convergence Theorem.	**10**	**L2**	**CO1**
	b.	Discuss relation between the perceptron and bayes classifier for a gaussian environment.	**10**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	What is Multi Layer Perceptron (MLP) and explain how does it differ from a single layer perceptron.	**10**	**L2**	**CO2**
	b.	Explain Back propogation algorithm and its importance in training multilayer perceptrons.	**10**	**L2**	**CO2**
		OR			
Q.4	**a.**	Explain how a multilayer perceptron trained by Back-propogation can solve the XOR problem, where as a single layer perceptron cannot.	**10**	**L2**	**CO2**
	b.	Discuss Heuristics for making the back-propagation algorithm perform better.	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	What is regularization in the context of deep learning? Explain L2 parameter regularization in detail.	**10**	**L2**	**CO3**
	b.	Discuss the following : i) Dataset Augmentation ii) Semi Supervised Learning.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Write a short note on : i) Ill conditioning ii) Plateaus, saddle points and other flat regions.	**10**	**L2**	**CO3**
	b.	Elaborate the challenges local minima, long term dependencies and Cliffs and exploding gradients involved in optimization for training deep model.	**10**	**L2**	**CO3**

		Module – 4			
Q.7	**a.**	Explain convolution neural network in detail.	**10**	**L2**	**CO4**
	b.	Discuss pooling in CNN.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	Describe the variants of the basic convolution function in brief.	**10**	**L2**	**CO4**
	b.	With the context of convolutional networks, Explain structured output and data types.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Discuss Recurrent Neural Networks.	**10**	**L6**	**CO5**
	b.	Explain the idea of unfolding computational graph across a deep network structure.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the following: i) Bidirectional RNNs ii) Encoder-Decoder sequence – to – sequence architectures.	**10**	**L2**	**CO5**
	b.	Explain the modes long short-term memory and network based on the gated recurrent unit.	**10**	**L2**	**CO5**

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Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.**	Explain the basic terminology of crypto along with its black box.	**4**	**L2**	**CO1**
	b.	Explain simple substitution cipher with an example.	**8**	**L3**	**CO1**
	c.	Discuss double transposition cipher with an example.	**8**	**L3**	**CO1**
		OR			
Q.2	**a.**	Explain modern crypto history.	**6**	**L2**	**CO1**
	b.	Describe the Taxonomy of cryptography.	**7**	**L2**	**CO1**
	c.	Describe the Taxonomy of cryptanalysis.	**7**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Discuss the requirements of a cryptographic hash function.	**6**	**L2**	**CO2**
	b.	Explain Cryptographic Tiger Hash Algorithm.	**10**	**L3**	**CO2**
	c.	Explain the uses of a hash function.	**4**	**L2**	**CO2**
		OR			
Q.4	**a.**	Define secret sharing. Explain the concept of secret sharing using key escrow.	**10**	**L3**	**CO2**
	b.	Discuss the usage of random numbers with unpredictability.	**6**	**L2**	**CO2**
	c.	Explain the categorization of water marks.	**4**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Define Randomness. Differentiate between deterministic and non-deterministic generators.	**10**	**L2**	**CO3**
	b.	Explain the freshness mechanism in detail.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Explain the problems related to passwords.	**4**	**L2**	**CO3**
	b.	Describe the dynamic password schemes based on challenge - response.	**8**	**L2**	**CO3**
	c.	Explain the Diffie-Hellman key agreement protocol.	**8**	**L2**	**CO3**

		Module – 4			
Q.7	**a.**	Explain the key life cycle with a neat diagram.	**4**	**L2**	**CO4**
	b.	Discuss key distribution approaches to acquiring shared keys from a KC.	**10**	**L2**	**CO4**
	c.	Explain the key storage risk factor.	**6**	**L2**	**CO4**
		OR			
Q.8	**a.**	Explain the fields of X.509 version 3 public-key certificate.	**8**	**L2**	**CO4**
	b.	Explain the public-key certificate management models.	**12**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain simple SSL hand shake protocol.	**10**	**L2**	**CO5**
	b.	Discuss the SSL key management in detail.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Discuss WLAN design issues.	**5**	**L2**	**CO5**
	b.	Explain GSM and UMTS key management.	**10**	**L2**	**CO5**
	c.	Discuss the usage of cryptography in video broadcasting.	**5**	**L2**	**CO5**

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BAI515A

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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? Why is vision so difficult? Discuss the real-world examples of computer vision.	**10**	**L2**	**CO1**
	b.	With a neat diagram, explain the image sensing pipeline and its important effects.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Explain in detail the Bidirectional Reflectance Distribution Function (BRDF).	**10**	**L2**	**CO1**
	b.	Explain the linear filtering along with examples of linear filtering.	**10**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Explain the Bilateral filtering in detail.	**10**	**L2**	**CO2**
	b.	Explain the derivation of Discrete Fourier Transform (DFT) form the continuous transform of the sampled function.	**10**	**L2**	**CO2**
		OR			
Q.4	**a.**	Explain the binary image processing. Obtain the distance transform D(i, j) of a binary image B(i, j).	**10**	**L2**	**CO2**
	b.	Explain the wavelets of image processing. Describe the application of Laplacian pyramid.	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Give the probability density functions for all which are commonly found in image processing applications.	**10**	**L2**	**CO3**
	b.	Discuss the noise reduction capabilities of the following spatial filters : i) Mean filters ii) Adaptive filters.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	Explain the more advanced techniques for edge detection.	**10**	**L2**	**CO3**
	b.	Write the region–growing algorithm for 8-connections. Explain the concept of region splitting and merging.	**10**	**L2**	**CO3**

Module – 4					
Q.7	**a.**	Explain any two color models along with conversion technique of one model to another model and vice-versa.	**10**	**L2**	**CO4**
	b.	Explain in detail image segmentation process based on color.	**10**	**L2**	**CO4**
OR					
Q.8	**a.**	Explain the concept of pseudo color image processing.	**10**	**L2**	**CO4**
	b.	Explain the color image smoothing and sharpening procedure.	**10**	**L2**	**CO4**
Module – 5					
Q.9	**a.**	Explain the following with respect to feature extraction : i. Boundary (border) following ii. Chain codes.	**12**	**L2**	**CO5**
	b.	Explain any 4 basic morphological algorithms.	**8**	**L2**	**CO5**
OR					
Q.10	**a.**	With the help of a diagrams, explain the concept of erosion, dilation, opening and closing used in morphological image processing.	**12**	**L2**	**CO5**
	b.	What is Pattern Classification? Explain the minimum distance classifier.	**8**	**L2**	**CO5**

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BCI515D

Fifth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.	What is Digital Image Processing? Mention atleast 8 examples of fields were Digital Image Processing used in detail.	10	L1	CO1
	b.	With neat diagram, elucidate the fundamental step in digital image processing.	10	L2	CO1
		OR			
Q.2	a.	With neat diagram, clearly mention the components of an Image Processing System.	10	L2	CO2
	b.	What is Image Sensing and Acquisition? With appropriate equations explain the image sampling and quantization.	10	L1	CO2
		Module – 2			
Q.3	a.	What is Spatial Filtering? With types, explain Intensity Transformation Functions List.	10	L1	CO2
	b.	Explain in detail, histogram processing. With necessary equations and diagrams.	10	L1	CO2
		OR			
Q.4	a.	Briefly explain the preliminary concept is frequency domain. Give background details.	10	L2	CO2
	b.	In detail explain the following i) Sampling ii) Fourier transforms and sampled functions.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the model of image degradation/restoration process.	10	L2	CO3
	b.	Illustrate how is restoration is performed in the presence of noise only. Give the restoration details.	10	L3	CO3
		OR			
Q.6	a.	Explain the periodic noise reduction by frequency domain filtering.	10	L2	CO3
	b.	With respect to image segmentation, explain the point, line sedge detection. Clearly show these detections are applied on image segmentation.	10	L3	CO3

		Module – 4			
Q.7	**a.**	Define Video Processing. Write how buffer data are managed in video transmission. Give suitable diagram.	**10**	**L3**	**CO4**
	b.	Explain Spatio-temporal sampling structures. Explain its types.	**10**	**L4**	**CO4**
		OR			
Q.8	**a.**	How are sampling structure conversion helps in video processing to maintain its accuracy and clarity to display. Explain.	**10**	**L3**	**CO4**
	b.	Explain motion detection in detail with diagram.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	How are video enhancement is stable is video processing. Draw and explain with neat diagram.	**10**	**L3**	**CO5**
	b.	Write short notes : i) Spatio – temporal noise filtering ii) Coding artifact reduction	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	How blotch detection used for removal of video enhancement to gain video quality. Explain with steps.	**10**	**L3**	**CO5**
	b.	Explain Koinescope Moire removal and scratch removal.	**10**	**L2**	**CO5**

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BAI654D

Sixth Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.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.**	Explain with examples, some of the task domains of Artificial Intelligence. Explain Question Answering.	**10**	**L2**	**CO1**
	b.	Explain the application of control strategies and heuristic search for production systems.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Bring out the features that used to represent AI as exploiting knowledge. Give the data structures and algorithm for a program that converts input text into structured internal form.	**10**	**L3**	**CO1**
	b.	Explain with examples, the issues in the design of search programs.	**10**	**L3**	**CO1**
		Module – 2			
Q.3	**a.**	Define the desirable properties of good system for representation of knowledge, with an algorithm explain property inheritance.	**10**	**L2**	**CO2**
	b.	With examples, show representation of Instance , ISA relationship , Computable functions and predicates.	**10**	**L3**	**CO2**
		OR			
Q.4	**a.**	With examples, explain the selection of granularity of representation and finding the right structures.	**10**	**L1**	**CO2**
	b.	Explain forward V/s backward reasoning with examples. What are the three basic approaches to the problem of conflict resolution in production system?	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Explain the key issues to be addressed in non montonic reasoning systems? Explain with examples working of default logic and abduction.	**10**	**L1**	**CO3**
	b.	Define and explain the notions of Bayes Theorem with example. Describe some of the properties to be satisfied by combining functions.	**10**	**L2**	**CO3**
		OR			
Q.6	**a.**	With examples, describe the working of non dependency directed back tracking and context lattices.	**10**	**L1**	**CO3**
	b.	Bring out the concepts of Bayesian networks like Causality , DAG , Conditional probabilities with examples.	**10**	**L2**	**CO3**

Module – 4					
Q.7	**a.**	Explain the working of MINIMAX search procedure with example.	**10**	**L2**	**CO5**
	b.	Write algorithms for Depth First Iterative deepening and Iterative Deepening A* and illustrate on an example.	**10**	**L3**	**CO5**
OR					
Q.8	**a.**	Explain the various components of natural language understanding process.	**10**	**L2**	**CO5**
	b.	Give simple grammar for fragment of English and differentiate Top down V/s Bottom up parsing.	**10**	**L3**	**CO5**
Module – 5					
Q.9	**a.**	Explain the working of Rote learning and learning by taking advice.	**10**	**L2**	**CO4**
	b.	Explain Knowledge Acquisition process in MOLE and SALT.	**10**	**L1**	**CO4**
OR					
Q.10	**a.**	Explain the working and characteristics of Theory driven discovery.	**10**	**L2**	**CO4**
	b.	Explain the rules included in R1 , PROSPECTOR and DESIGN ADVISOR shells.	**10**	**L2**	**CO4**

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **BAI702**

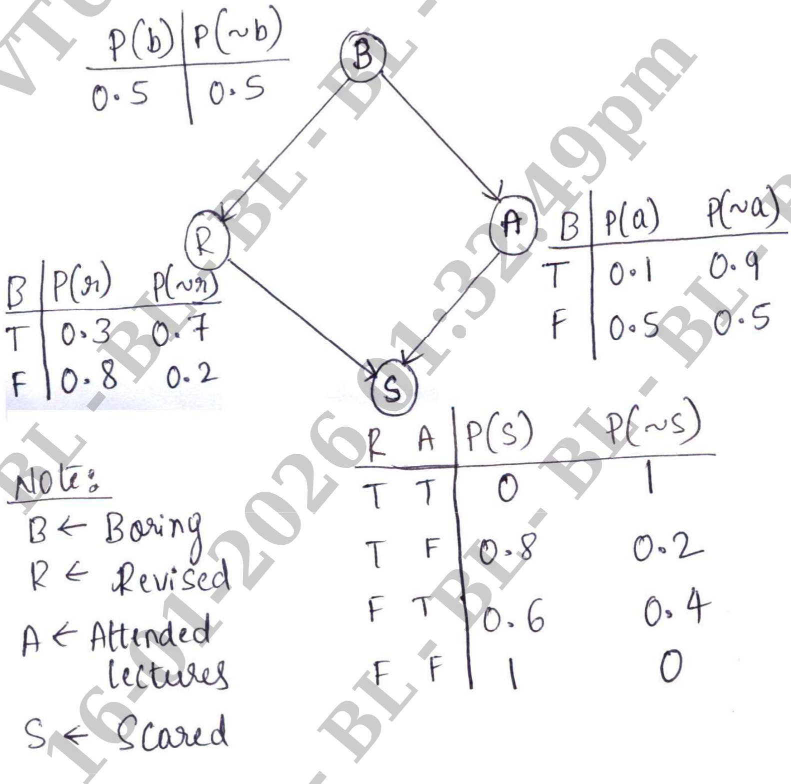
Seventh Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026

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.**	Explain the fundamental design issues and approaches considered while developing a machine learning program for playing checkers game.	**10**	**L2**	**CO1**
	b.	Describe the key perspectives and issues in machine learning.	**04**	**L2**	**CO1**
	c.	State and prove the Version space representation theorem. Clearly show that : i) Every hypothesis 'h' satisfying $(\exists s \in S)\ (\exists g \in G)\ (g \geq_g h \geq s)$ is a member of $VS_{H,D}$ ii) Every hypothesis in $VS_{H,D}$ satisfies this condition.	**06**	**L3**	**CO1**
		OR			
Q.2	**a.**	Describe well – posed learning problems in machine learning with suitable examples.	**05**	**L2**	**CO1**
	b.	Explain Enjoy Sport concept learning task.	**05**	**L2**	**CO1**
	c.	Outline the steps involved in the candidate – Elimination algorithm for computing version space and explain with an example.	**10**	**L3**	**CO1**
		Module – 2			
Q.3	**a.**	Explain general – to – specific beam search and LEARN –ONE –RULE algorithm.	**10**	**L2**	**CO2**
	b.	Using a small relational dataset, explain the FOIL algorithm and apply the same to generate first – order rule.	**10**	**L3**	**CO2**
		OR			
Q.4	**a.**	Outline the explanation –based learning algorithm PROLOG – EBG with help of SafeToStack example.	**10**	**L3**	**CO2**
	b.	Describe how explanation based learning can be used to derive search control knowledge.	**06**	**L2**	**CO2**
	c.	List the three different methods for using prior knowledge to alter the search performed by purely inductive methods.	**04**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Explain the AdaBoost algorithm and how it sequentially improves weak classifiers.	**08**	**L2**	**CO2**
	b.	Outline the steps of basic random forest training algorithm.	**04**	**L2**	**CO2**
	c.	Explain the K – means algorithm with an example.	**08**	**L2**	**CO2**
		OR			
Q.6	**a.**	Explain ensemble learning and why combining multiple models often improves performance compared to a single model.	**06**	**L2**	**CO3**
	b.	Explain the K – Means neural network algorithm.	**08**	**L2**	**CO3**
	c.	Outline the steps of the mixture of experts algorithm.	**06**	**L2**	**CO3**

		Module – 4			
Q.7	**a.**	Describe the vector quantization with diagram that shows an interpretation of prototype vectors in two dimensions.	**04**	**L2**	**CO3**
	b.	Illustrate the self organizing feature map algorithm.	**08**	**L3**	**CO3**
	c.	Explain the following with respect to self organizing feature map. i) Self – Organization ii) Network dimensionality and boundary conditions.	**08**	**L2**	**CO3**
		OR			
Q.8	**a.**	Discuss the following : i) The Box – Muller scheme ii) Monte Carlo Principle.	**10**	**L2**	**CO4**
	b.	Describe Markov Chain Monte Carlo (MCMC) and explain Metropolis – Hastings algorithm used for MCMC.	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Consider the Bayesion network as shown in fig. Q. 9 (a) and identify the following. i) The probability of being scared ii) The probability the student revised given that they are scared iii) The probability they attended given that they are scared.  Fig. Q. 9(a)	**10**	**L3**	**CO4**
	b.	Explain the Hidden Markov Models (HMMs) Forward algorithm and HMM Viterbi algorithm.	**10**	**L2**	**CO4**
		OR			
Q.10	**a.**	Illustrate the steps of Kalman filter algorithm and particle filter algorithm.	**10**	**L3**	**CO4**
	b.	Explain the Baum – Welch algorithm.	**10**	**L2**	**CO4**