B.L.D.E.A's V.P.Dr.P.G.HALAKATTI COLLEGE OF ENGINERING AND TECHNOLOGY VIJYAPUR 586103

QUESTION PAPERS June July 2024

COMPUTER SCIENCE AND INFORMATION SCIECNCE DEPARTMENT

CBCS SCHEME

USN | | | | | | | | | | | 18CS72

Seventh Semester B.E. Degree Examination, June/July 2024
Big Data Analytics

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1. a. What is data? How do you classify data as structured, semistructured, multistructured and unstructured data? Give suitable examples. **(10 Marks)**
   b. Define big data. Describe characteristics and types of Big data. **(10 Marks)**

OR

2. a. Explain the role of big data in medicine and healthcare system. **(10 Marks)**
   b. Explain the functions of each of the five layers in big data architecture design with a diagram. **(10 Marks)**

Module-2

3. a. Give the purpose of Hadoop, describe the core components and features. **(10 Marks)**
   b. List and explain the HDFS commands. **(10 Marks)**

OR

4. a. Explain in detail about Hadoop MapReduce framework with programming model. **(12 Marks)**
   b. Describe Hadoop YARN and Hadoop execution model. **(08 Marks)**

Module-3

5. a. What is NOSQL? Explain the characteristics and features of NOSQL. **(08 Marks)**
   b. Explain in detail about NOSQL data architecture pattern. **(12 Marks)**

OR

6. a. Explain BASE and CAP theorems in detail. **(10 Marks)**
   b. Explain in detail the MongoDB along with its characteristics. **(10 Marks)**

Module-4

7. a. Explain relation algebra operations with an example. **(08 Marks)**
   b. Define Hive. List out characteristics, limitations and explain hive architecture in detail. **(12 Marks)**

OR

8. a. Explain in detail about map-tasks, key value, pair grouping by key. **(10 Marks)**
   b. Explain the pig architecture in detail. **(10 Marks)**

Module-5

9. a. Explain the text mining process architecture and applications. **(10 Marks)**
   b. Explain the 3 types of web mining. **(10 Marks)**

OR

10. a. Explain the working of simple linear regression, along with a real-world application illustration. **(12 Marks)**
    b. Compare Text Mining and Data Mining. **(08 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2024
User Interface Design

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. Define User Interface Design. Explain the need of user interface design in user's perspective. **(08 Marks)**
   b. Explain the importance of user interface design. **(04 Marks)**
   c. Discuss Direct and Indirect manipulation. **(08 Marks)**

OR

2 a. Explain general principles of user interface design. **(08 Marks)**
   b. Explain the important characteristics of graphical user interface. **(08 Marks)**
   c. Differentiate between graphical and web user interface. **(04 Marks)**

Module-2

3 a. Explain 5 commandments in designing for people. **(07 Marks)**
   b. List and explain the pitfalls in development path of the design process. **(07 Marks)**
   c. Discuss the necessity of human interaction speed. **(06 Marks)**

OR

4 a. Explain in detail business definition and requirement analysis in user's perspective. **(10 Marks)**
   b. Explain the importance of obstacles and usability partical objectives. **(10 Marks)**

Module-3

5 a. Explain in detail functions of menus with example. **(10 Marks)**
   b. Determine the basic functionalities of navigating menus and graphical menus. **(10 Marks)**

OR

6 a. Explain the structures of menus in detail. **(10 Marks)**
   b. Discuss Website Navigation in detail. **(10 Marks)**

Module-4

7 a. Define windows. Explain the important characteristics of windows. **(10 Marks)**
   b. Discuss windows presentation styles. **(10 Marks)**

OR

8 a. List and explain types of windows. **(08 Marks)**
   b. Explain window operations in detail. **(06 Marks)**
   c. Explain the important characteristics of device-based controls. **(06 Marks)**

Module-5

9 a. Discuss screen based controls. **(10 Marks)**
   b. Write a note on different prototypes used in user interface design. **(10 Marks)**

OR

10 a. Compare user test and usability test. Explain the process involved in developing and conducting a test. **(10 Marks)**
   b. Write a short note on the following :
      i) Radio buttons   ii) Check boxes   iii) List boxes
      iv) Drop-down/pop-up list boxes   v) Palettes **(10 Marks)**

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18CS744

Seventh Semester B.E. Degree Examination, June/July 2024
Cryptography

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. What are the three independent dimensions of cryptography? Explain. **(06 Marks)**
   b. Explain unconditionally secure and computationally secure encryption schemes. **(04 Marks)**
   c. If intruder has an access to part of plaintext and corresponding cipher text generated using Hill Cipher. Part plaintext is TECH and corresponding Cipher text is NQUZ. Estimate key and decrypt the message NQUZ TQTE. **(10 Marks)**

OR

2 a. Compare stream Cipher and block Cipher. **(06 Marks)**
   b. Illustrate one round of Feistel Cipher. Assume that the data received from previous round is 1A2B3C4D and key used is 123ABC. **(04 Marks)**
   c. Explain DES algorithm and its strength. **(10 Marks)**

Module-2

3 a. Illustrate the application of public-key cryptosystem for
      i)   Authentication
      ii) Secrecy
      iii) Authentication and secrecy application. **(10 Marks)**
   b. Encrypt plaintext 9 using the RSA public-key encryption algorithm. Use prime numbers $p = 7$ and $q = 11$ to generate the public and private keys. Demonstrate Chinese reminder theorem in RSA while decrypting. **(10 Marks)**

OR

4 a. Illustrate Man-in-the-Middle attack in Diffie-Hellman key exchange algorithm. **(05 Marks)**
   b. Compute public-key and secrete key of two users using Diffie-Hellman key exchange algorithm. Use $q = 353$, $X_A = 97$ and $X_B = 233$. **(10 Marks)**
   c. Explain Elgamal cryptographic algorithm. **(05 Marks)**

Module-3

5 a. Summarize Abelian group and Elliptic curves over real numbers. **(06 Marks)**
   b. List the two families of elliptic curves used in cryptography applications and explain them. **(08 Marks)**
   c. Consider the group $E_{23}(1, 1)$ compute 3G left base point $G = (3, 10)$. **(06 Marks)**

OR

6 a. Explain the public-key authority technique and public-key certification technique of public-key distribution. How they are more secure than public announcements and publicly available directory, technique? **(10 Marks)**
   b. Explain simple key distribution mechanism and illustrate man-in-the-middle attack for the scheme. Explain any one scheme to over come the attack. **(10 Marks)**

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Module-4

7 a. What requirements are not satisfied by X509 version 2? Explain each extension of version 3.
(10 Marks)

b. Illustrate the working of Kerberos and explain the Kerberos exchanges among the parties in a network.
(10 Marks)

OR

8 a. Write about the following with respect to S/MIME:
   i) S/MIME functionalities.
   ii) Cryptography algorithm used.
(10 Marks)

b. What is Domain keys identified mail? Summarize internet mail architecture.
(10 Marks)

Module-5

9 a. What is IPsec? List its applications. Illustrate how 1Psec is used in an organization.
(08 Marks)

b. Compare transport mode and tunnel mode with respect to functionalities supported by security services of 1Psec. Taking an example explain how tunnel mode IPsec operates.
(06 Marks)

c. Recall the services of ESP. With a neat diagram, explain ESP packet format.
(06 Marks)

OR

10 a. Illustrate using ESP with IPV4 and IPV6. Summarize the transport mode operation.
(10 Marks)

b. What is the use of Tunnel Mode ESP? Explain the steps that occur when an external host wishes to communicate with a host on an internal network protected by a firewall, and in which ESP is implemented in the external host and the firewalls.
(10 Marks)

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18CS753

Seventh Semester B.E. Degree Examination, June/July 2024
Introduction to Artificial Intelligence

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1   a. State and explain the Physical symbol system Hypothesis. Brief 3 important AI techniques. **(10 Marks)**
    b. Analyze "Missionaries and Cannibals" problem with respect to the seven problem characteristics. **(10 Marks)**

OR

2   a. Write an algorithm that can perform Breadth First Search. List the issues in the design of search programs. **(10 Marks)**
    b. Explain problem, problem spaces and search for the Water Jug Problem. Specify set of Rules and give one solution to the Water Jug Problem. **(10 Marks)**

Module-2

3   a. Explain four different approaches to knowledge representation. Compare procedural and declarative knowledge. **(10 Marks)**
    b. Explain unification process in detail with example. **(10 Marks)**

OR

4   a. Was Marcus loyal to Caesar? Solve using Backward chaining :
    (i)   Marcus was a man.
    (ii)   Marcus was a Pompeian.
    (iii)   All Pompeian's were Romans.
    (iv)   Caesar was a ruler.
    (v)   All Romans were either loyal to Caesar or hated him.
    (vi)   Everyone is loyal to someone.
    (vii)   People only try to assassinate Rulers they aren't loyal to.
    (viii) Marcus tried to assassinate Caesar.
    (ix)   All men are people. **(10 Marks)**
    b. Consider the following knowledge base :

$\forall x : \forall y : cat(x) \wedge fish(y) \rightarrow likes-to-eat(x,y)$

$\forall x : calico(x) \rightarrow cat(x)$

$\forall x : tuna(x) \rightarrow fish(x)$

tuna (Charlie)

tuna (Herb).

    (i)   Convert above knowledge base into Horn Clauses.
    (ii)   Convert the Horn Clauses into a PROLOG program. **(10 Marks)**

Module-3

5 a. Explain Non-monotonic Reasoning and Statistical Reasoning. Compare Abduction and Inheritance logic under non-monotonic Reasoning. **(10 Marks)**

   b. Explain Minimalist Reasoning and Closed World Assumption (CWA) in detail. **(10 Marks)**

OR

6 a. Explain Rule-based Reasoning and the properties of Certainty Factor (CF) in statistical reasoning. **(10 Marks)**

   b. What are Bayesian Networks? Briefly explain the three algorithms used for computations in Bayesian networks. **(10 Marks)**

Module-4

7 a. What is "Game Playing" in Artificial Intelligence? Explain the importance of game playing in Artificial Intelligence. **(10 Marks)**

   b. Explain Alpha-Beta Pruning with an example. Write its properties. **(10 Marks)**

OR

8 a. What are the steps involved in Natural Language Processing? Explain each one of them. **(10 Marks)**

   b. List the causes of errors in the spelling and explain the usage of Soundex Algorithm with suitable example. **(10 Marks)**

Module-5

9 a. Explain learning by parameter adjustment and learning with Macro-Operators in problem solving. **(10 Marks)**

   b. Explain BACON : Data driven discovery. **(10 Marks)**

OR

10 a. Explain Expert systems. **(10 Marks)**

   b. What are the four major problems facing by current expert systems? **(10 Marks)**

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18CS752

Seventh Semester B.E. Degree Examination, June/July 2024
Python Application Programming

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. List the features of python programming language. **(06 Marks)**
   b. Differentiate compiler and interpreter. **(04 Marks)**
   c. Describe arithmetic operators, assignment operators, comparison operators, logical operators and Bitwise operators in detail with examples. **(10 Marks)**

OR

2 a. List and give syntax of all python supported conditional statements and explain its usage with an example. Write a program to check whether the given number is positive or negative or zero. **(08 Marks)**
   b. Write a short note on:
      i)   ** and // operators
      ii) Types of errors
      iii) Built-in function. **(06 Marks)**
   c. Write python programs to
      i)   Find largest of 3 numbers
      ii) Check whether the given year is leap year or not with a function. **(06 Marks)**

Module-2

3 a. With syntax and example code, explain the working of definite loop in python. **(06 Marks)**
   b. Write a python program to demonstrate counting, summing and average of elements using loops. **(06 Marks)**
   c. Explain the concept of string slicing and predict the output for the following code (consider the string str = "Hello World")
      i)   print("str[:] is", str[:])
      ii) print("str[0:5] is", sf[0:5])
      iii) print("str[4:4] is", st[4:4])
      iv) print("str[3:8:2] is", str[3:8:2])
      v)   print(str[-1:]). **(08 Marks)**

OR

4 a. Explain the concepts of infinite loops. Differentiate 'break' and 'continue' statements with an example. **(06 Marks)**
   b. What is a string? Write a python program to demonstrate traversal through a string with a loop. Also explain the concept of string slicing. **(07 Marks)**
   c. Explain file open, file close, file read and file write concepts in python with example. **(07 Marks)**

Module-3

5 a. What is list? Explain the following methods with an example:
   i) append( )   ii) sort( )   iii) Reverse( ). **(10 Marks)**

   b. What is dictionary? How is it different from list? Write a python program to count the occurrence of characters in a string and print the count. **(06 Marks)**

   c. What is tuples? Compare and contrast lists and tuples. **(04 Marks)**

OR

6 a. Discuss the lists handling functions in python with example. **(08 Marks)**

   b. Explain 'DSU' pattern with respect to tuples. Write a python code to determine tuples by sorting a list of words from longest to shortest using loops. **(08 Marks)**

   c. Explain the need of regular expression in python language. **(04 Marks)**

Module-4

7 a. Define class and object. Explain the working of init method with suitable code. **(06 Marks)**

   b. Define attribute. With the help of python code explain how functions return instance values. **(06 Marks)**

   c. Explain the concept of modifier with python code. **(08 Marks)**

OR

8 a. What is the difference between method and function? Also explain programmer defined types with an example. **(10 Marks)**

   b. Illustrate the concepts of pure function with python code. **(10 Marks)**

Module-5

9 a. Write a python code to read the file from web using urllib and retrieve the data of the file. **(10 Marks)**

   b. What is XML? How is it used in python? Explain parsing of XML with example. **(10 Marks)**

OR

10 a. Define cursor. Explain connect, execute and close command of databases with suitable example. **(10 Marks)**

   b. Write a python code for creating employee database, inserting records and selecting the employees working in the company. **(10 Marks)**

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18CS731

Seventh Semester B.E. Degree Examination, June/July 2024
Software Architecture and Design Patterns

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. What is a Design Pattern? List and explain the various templates used in Design Pattern.
(08 Marks)
  b. List and explain the different classification of Design Pattern. (06 Marks)
  c. Explain the different Step – by – Step approach in applying a design pattern effectively.
(06 Marks)

OR

2 a. Explain the two categories done in requirement analysis. Write the use case for Adding new books. (10 Marks)
  b. What are the problems faced in Use case for Book check? Write the rules used to rectify this problem and also write use case for revised Book check out. (10 Marks)

Module-2

3 a. When do you use structural patterns? Explain the applicability, structure and participants of Bridge design pattern. (10 Marks)
  b. Explain Motivation , Applicability and Structure of Decorator design pattern. (10 Marks)

OR

4 a. Explain Motivation , Applicability and Participants of Facade design pattern. (10 Marks)
  b. Explain Motivation , Applicability , Structure of Flyweight design pattern. (10 Marks)

Module-3

5 a. Define Behavioural design pattern. Explain Motivation , Applicability , Participants of Command design pattern. (10 Marks)
  b. Explain Motivation , Applicability and Implementation of Interpreter design pattern.
(10 Marks)

OR

6 a. Explain Motivation , Applicability , Structure of a Mediator design pattern. (10 Marks)
  b. Explain Applicability , Participants and Collaborations of a Memento design pattern.
(10 Marks)

Module-4

7 a. What is MVC Architecture pattern? Explain and list the benefits. (10 Marks)
  b. Explain Designing the system , Substance for an Interactive system. (10 Marks)

OR

8 a. Write and explain the code for Implementation of model , view and controller. (10 Marks)
  b. List the issues in context of implementing the Undo operation. (06 Marks)
  c. Write and explain the Sequence diagram for adding a line. (04 Marks)

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Module-5

9 a. Explain the Client / Server architecture in detail.   (10 Marks)
   b. Explain Implementing an Object – oriented system on the web.   (06 Marks)
   c. Write a note on Input and Output in Java Servlet.   (04 Marks)

OR

10 a. Briefly explain steps used to setup a Remote Object System.   (14 Marks)
    b. Explain GET and POST methods.   (06 Marks)

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Seventh Semester B.E. Degree Examination, June/July 2024
Advanced Artificial Intelligence

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. What are the four basic types of agent program in any intelligent system?   **(05 Marks)**
   b. Explain why we can them as learning agents?   **(05 Marks)**
   c. Explain following algorithm :
      (i)   Minimax algorithm.
      (ii)   Alpha-Beta Pruning taking appropriate example solution to each.   **(10 Marks)**

OR

2 a. Explain Stochastic Games cuing schematic game tree for a backgammon position. **(06 Marks)**
   b. Using Min Max explain the Evaluation function for games of chance.   **(04 Marks)**
   c. Explain partially observable games using Kriegspiel and Partially observable chess.
                                                                              (10 Marks)

Module-2

3 a. A bag contains 4 balls. Two balls are drawn at random without replacement and are found to be white. What is the probability that all balls in the bag are white?   **(10 Marks)**
   b. Three urns are there containing white and black balls; first urn has 2 white and 3 black balls, second urn has 3 white and 2 black balls and third urn has 4 white and 1 black balls without any biasing one urn is chosen from that one ball is chosen randomly which was white. What is the probability that it came from the 2nd urn?   **(10 Marks)**

OR

4 a. Explain the function of first principles.   **(10 Marks)**
   b. Using the axioms of probability, prove that any probability distribution on a discrete random variable must sum to 1.   **(10 Marks)**

Module-3

5 a. A patient has a disease N, Physicians measure the value of a parameter P to see the disease development. The parameter can take one of the following values {low, medium, high}. The value of P is a result of Patient's unobservable condition | state S. S can be {good, poor}. The state changes between 2 consecutive days in one fifth of cases. If the patient is in good condition, the value is rather high (having 10 measurements, 3 are low, 3 medium and 4 high). On arrival to the hospital on day 0, the patient's condition was unknown, i.e., $P_r(SO = GOOD) = 0.5$
      (i)   Draw the transition and sensor model of the dynamic Bayesian network modeling the domain under consideration.
      (ii) Calculate probability that the patient is in good condition on day 2 given low P values on days 1 and 2.
      (iii) Can you determine the most likely patient state sequence in days 0, 1 and 2 without any additional computations? Justify.   **(10 Marks)**
   b. What is Bayesian network? Explain the topology and conditional distribution with respect to Bayesian network.   **(10 Marks)**

OR

6 a. Explain Rule-based methods for uncertain reasoning. (05 Marks)
   b. What are its components taking an example of diagnosis rules for a car-repair expert system, explain rule based methods. (05 Marks)
   c. Explain representing vagueness, Fuzzy sets and Fuzzy logic. (10 Marks)

Module-4

7 a. Explain the following image processing operations, with diagram,
       (i)   Edge detection.
       (ii) Texture (10 Marks)
   b. Write short notes for the following using vision :
       (i)   Words and Pictures
       (ii)   Reconstruction from many views.
       (iii) Controlling movement. (10 Marks)

OR

8 a. Explain the following concepts of reconstructing the 3D world with neat diagram:
       (i)   Texture
       (ii)   Shading
       (iii) Contour (10 Marks)
   b. Explain the following object detection by structural information :
       (i)   The geometry of bodies : finding arms and legs
       (ii) Coherent appearance : Tracking people in video. (10 Marks)

Module-5

9 a. List and explain different phases of analysis in Natural Language processing. (10 Marks)
   b. Write Regular Expression for the following :
       (i)   To accept strings book or books.
       (ii)   To accept color and colour.
       (iii) To accept any +ve integer with an optional decimal point.
       (iv)   To check a string is an email address or not.
       (v)   To accept all variations of MHz, Mhz, mHz, mhz, MegaHertz, Megahertz, MegaHertz, megahertz (10 Marks)

OR

10 a. What is language modeling? Explain various types of statistical language model. (10 Marks)
   b. Write short note on the following :
       (i)   Applications of NLP.
       (ii) Information retrieval and its issues. (10 Marks)

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Eighth Semester B.E. Degree Examination, June/July 2024
Neural Networks and Deep Learning

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a. With respect to reverse mode autodiff in tensor flow, explain the main benefits and drawbacks of creating a computation graph rather than directly executing the applications.
(06 Marks)

b. Explain the steps required to feed the data to the training algorithm in tensor flow. **(04 Marks)**

c. With code snippet, explain the following :
i)   Modularity and sharing variables in Tensor flow
ii) Save and restore the models in tensor flow.
(10 Marks)

OR

2   a. With code snippet explain two different phases while training a DNN using tensor flow.
(10 Marks)

b. With a neat diagram explain the architecture of a multilayer perceptron. **(10 Marks)**

Module-2

3   a. With the code snippet and equations discuss Xavier and the initialization pertaining to vanishing/exploding gradients problem.
(10 Marks)

b. With the code snippet, explain Leaky Relu, a non saturating activation function related to vanishing gradient problem.
(10 Marks)

OR

4   a. Write a note on Batch Normalization and Gradient clipping which supports exploding gradients problem.
(10 Marks)

b. With an example, discuss how tweaking, dropping or replacing the upper layers helps in improving the performance of DNN model.
(10 Marks)

Module-3

5   a. Illustrate asynchronous communication using Tensor flow Queues with code snippet and diagram.
(10 Marks)

b. Briefly explain with a diagram, parallelizing neural networks on a Tensor flow cluster on condition of one neural network per device.
(10 Marks)

OR

6   a. Discuss convolutional layer features with a diagram and explain the methods for stacking multiple features maps.
(10 Marks)

b. What are pooling layers, explain Tensor flow implementations of pooling layers with a diagram and code.
(10 Marks)

Module-4

7   a. Explain Recurrent Neural Networks and describe output of a recurrent layer for a single instance as well as all instances in a mini batch.
(10 Marks)

b. With respect to Basic RNNs in tensor flow, write a note on:
  i) Static unrolling through time.
  ii) Dynamic unrolling through time. **(10 Marks)**

OR

8 a. With diagram and code snippet explain the steps required for training to predict time series in RNN. **(10 Marks)**

   b. With LSTM cell diagram, explain LSTM computations features. **(10 Marks)**

Module-5

9 a. Discuss performing Principle Component Analysis (PCA) with an under complete linear autoencoder code. **(10 Marks)**

   b. Briefly explain Sparse Autoencoders and denoising autoencoders with a neat diagram. **(10 Marks)**

OR

10 a. With a neat diagram and code snippet, describe the features of Neural Network policies. **(10 Marks)**

    b. Summarize the application features of Markov Decision Processes with respect to Bellman optionality equation and values iteration algorithm. **(10 Marks)**

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Eighth Semester B.E. Degree Examination, June/July 2024
System Modeling and Simulation

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. What is simulation and explain the different steps in simulation study with neat flow chart. **(10 Marks)**

   b. A small grocery store has only one check out counter customer arrive at counter at randome from 1 to 8 min apart. Each possible value of service time has same probability of occurrence. Service time varies from 1 to 6 mins apart. Each possible values of service time has same probability of occurrence. Develop simulation distribution table and calculate
      (i)   Average waiting time
      (ii) Probability waiting time.
      (iii) Probability of idle server.
   Given :
   Random digit for arrival time :
   913 727 015 948 309 922 753 235 302
   Service time : (Random digit)
   84 10 74 53 17 79 91 67 89 38   **(10 Marks)**

OR

2 a. List and explain circumstances when simulation is not an appropriate tool. **(10 Marks)**

   b. Consider a store with one checkout counter. Prepare simulation table and find out average waiting time of customer in waiting queue, probability of idle server, average service time, given
   Inter arrival time : 3, 2, 6, 4, 4, 5, 8, 7
   Service time : 4, 5, 5, 8, 4, 6, 2, 3, 4
   Assume 1st customer arrives at t = 0.   **(10 Marks)**

Module-2

3 a. Explain discrete random variable and continuous random variable. **(10 Marks)**

   b. Explain :
      (i) Binomial distribution
      (ii) Uniform distribution.   **(10 Marks)**

OR

4 a. List queuing notations for parallel server systems. **(10 Marks)**

   b. Explain steady state parameters of M/G/1 queue. **(10 Marks)**

Module-3

5 a. Sequence of numbers has been generated 0.44, 0.81, 0.14, 0.05, 0.93. Use Kolmogorov Smirnov test with $\alpha = 0.05$, test whether the hypothesis that numbers are uniformly distributed, can be accepted or rejected. Consider $P_\alpha = 0.565$. **(10 Marks)**

   b. What are pseudorandom numbers? Explain consideration for selection of routines to generate random numbers. **(10 Marks)**

OR

6 a. Discuss the concept of inverse transform technique to generate random numbers, using exponential distribution. **(10 Marks)**

   b. Generate three Poisson variants with mean α = 0.2 for given random number, 0.4357, 0.4146, 0.8353, 0.9952, 0.8004. **(10 Marks)**

Module-4

7 a. Explain data collection in input modeling and the suggestios for enhancing data collection technique. **(10 Marks)**

   b. Using goodness of fit test, test whether random numbers are uniformly distributed based on Poisson assumption with α = 0.05 and $\hat{\alpha}$ = 3.64 . Data is as :

Interval:	0	1	2	3	4	5	6	7	8	9	10	11
Observed frequency :	12	10	19	17	10	8	7	5	5	3	3	1

(10 Marks)

OR

8 a. Explain measures of performance. **(10 Marks)**

   b. Explain multivariate and time series input models. **(10 Marks)**

Module-5

9 a. Explain model building, verification and validation. **(10 Marks)**

   b. Explain iterative process of calibration model. **(10 Marks)**

OR

10 a. Write a note on validation of model assumption. **(10 Marks)**

    b. Explain optimization via simulation. **(10 Marks)**

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Third Semester B.E. Degree Examination, June/July 2024
Data Structures and Applications

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　Max. Marks: 100

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

Module-1

1　a.　Write a program in C to demonstrate how whole structure is passed as a parameter to a function. **(04 Marks)**

　　b.　Define DMA. List and explain different DMA functions used in C. **(08 Marks)**

　　c.　Explain the representation of linear array in memory and give example. **(08 Marks)**

OR

2　a.　Consider two polynomials $A(x) = 7X^{1000} + 4$ and $B(x) = x^4 + 5x^3 + 4x^2 + 3$. Show diagrammatically how these two polynomials can be stored in a single dimensional array. **(04 Marks)**

　　b.　Define polynomial and degree of the polynomial. Write the representation of polynomial using array and structures. **(08 Marks)**

　　c.　Write a program in C to read sparse matrix of integer values and to search the sparse matrix for an element specified by the user. **(08 Marks)**

Module-2

3　a.　Define Stack. Give the C implementation of push and pop function. Include check for empty and full condition of stack. **(07 Marks)**

　　b.　Convert the following infix expression into prefix and postfix expressions:
　　　　i)　　$((H * (((A + ((B + C) * D)) * F) * G) * E)) + J)$
　　　　ii)　　$A/B - C + D * E - A * C$ **(08 Marks)**

　　c.　Write a program in c to implement tower of Hanoi using recursive function. **(05 Marks)**

OR

4　a.　Write a function in c to add, delete and display the elements from queue. **(07 Marks)**

　　b.　Write a program in c to implement the operations on a circular queue using dynamically allocated arrays. **(08 Marks)**

　　c.　What is priority queue? Briefly explain the types of priority queues. **(05 Marks)**

Module-3

5　a.　Write a program in C to implement Stack operations using single linked list. **(07 Marks)**

　　b.　Write a program in C to implement Queue operations using single linked list. **(08 Marks)**

　　c.　Write a program in C to count the number of nodes in a single linked list. **(05 Marks)**

OR

6　a.　Write a program in C to implement insert front, delete front and display functions using double linked list. **(07 Marks)**

17

b. Write a linked representation for the given sparse matrix.

$$A = \begin{bmatrix} 2 & 0 & 0 & 3 \\ 0 & 0 & 5 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 8 \\ 0 & 7 & 4 & 0 \end{bmatrix}$$

Fig.Q.6(b)

(08 Marks)

c. Differentiate between single linked list and double linked list. (05 Marks)

Module-4

7 a. Define binary tree and state its properties. Show how binary tree is represented using an array and linked list. (08 Marks)

b. Write the binary tree for the expression A/B * C * D + E. Write the result of preorder and post order traversals for the given expression. (07 Marks)

c. Write the algorithm for preorder and post order traversals. (05 Marks)

OR

8 a. Define Threaded Binary Tree. Write the memory representation of Threaded Binary Tree for the given graph. (08 Marks)

Fig.Q.8(a)

b. Draw the binary search tree for the following inputs and write recursive function to search for a given key value.

13   4   7   3   17   21   15   19   2   23

(07 Marks)

c. Write the applications of trees. (05 Marks)

Module-5

9 a. Define graph. What are the different methods of representing a graph? Give example. (10 Marks)

b. Define the following with an example:
   i)   Directed graph
   ii)   Multigraph
   iii) Complete graph
   iv)   Cyclic and acyclic graph
   v)   Loop. (10 Marks)

OR

10 a. Define BFS with an example. Write a function in C to implement BFS. (10 Marks)

b. What is Hashing? Briefly explain the different types of hashing techniques. Construct the hash table for storing C built-in functions,
acos, define, float, exp, char, atan, ceil, floor
Note: Use hash table with 26 buckets and 2 slots per bucket. (10 Marks)

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CBCS SCHEME

USN [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]   21CS33

Third Semester B.E. Degree Examination, June/July 2024
Analog and Digital Electronics

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. With a neat circuit diagram and mathematical analyses explain voltage divider bias circuit. **(10 Marks)**
   b. With a neat circuit diagram explain the working of relaxation oscillator. **(10 Marks)**

OR

2 a. List the advantages of active filters over passive filters. **(05 Marks)**
   b. Explain any two performance parameters of power supply. **(05 Marks)**
   c. Explain R-2R ladder type D to A converter. **(10 Marks)**

Module-2

3 a. Simplify the following expression using K-Map and draw the logic circuit using basic gates. $F(A, B, C, D) = \sum m(7) + \sum_d(10, 11, 12, 13, 14, 15)$. **(10 Marks)**
   b. Simplify the expression using Quine-McClusky method $F(A, B, C, D) = \sum m(0, 2, 3, 6, 7, 8, 10, 12, 13)$. **(10 Marks)**

OR

4 a. Using K-Map obtain SOP and POS expressions for
       $f(A, B, C, D) = \sum m(6, 8, 9, 10, 11, 12, 13, 14, 15)$. **(10 Marks)**
   b. With example explain,
       i)   Map-Entered variable method
       ii) Petricks method. **(10 Marks)**

Module-3

5 a. What is Hazard? With example explain static-0 and static-1 Hazards. **(10 Marks)**
   b. Implement following function using 8:1 multiplexer:
       $f(a, b, c, d) = \sum_m(0, 1, 5, 6, 8, 10, 12, 15)$. **(10 Marks)**

OR

6 a. Implement full adder using 3:8 decoder and NAND gates. **(10 Marks)**
   b. Design 7-segment decoder using PLA. **(10 Marks)**

Module-4

7 a. What are the 3 modeling styles in VHDL? Write VHDL code for full adder using structural model. **(10 Marks)**
   b. Derive the characteristics equations for D, T, SR and JK flip flops. **(10 Marks)**

1 of 2

OR

8 a. Draw the logic diagram of master slave JK flipflop using NAND gates and explain its working. **(10 Marks)**

   b. Explain the working of SR flipflop and show how it can be used in debounce circuit. **(10 Marks)**

Module-5

9 a. What is shift register? What are the different types of shift registers? Explain 8 bit serial-in serial-out shift register. **(10 Marks)**

   b. Explain the following:
   i) Sequential Parity Checker
   ii) Ring Counter. **(10 Marks)**

OR

10 a. Design Mod-5 synchronous counter using JK flip flop. **(10 Marks)**

   b. With diagram explain parallel adder with accumulator. **(10 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐ 21CS34

Third Semester B.E. Degree Examination, June/July 2024
Computer Organization and Architecture

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Draw and explain the connection between processor and memory with the respective registers. **(10 Marks)**

   b. Assuming that the reference computer is Ultra SPARCIO workstation with 300 MHz Ultra SPARC – Ili processor. A company has to purchase 500 new computers, hence ordered testing of a new computer with SPEC 2000. Following observations were made:

Programs	Runtime on reference computer	Runtime on new computer
1	50 minutes	5 minutes
2	75 minutes	4 minutes
3	60 minutes	6 minutes
4	30 minutes	3 minutes

   The company's system manager will place the orders for purchasing new computers only if the overall SPEC rating is at least 12. After the said test, will the system manager place order for the purchase of new computers? **(10 Marks)**

OR

2 a. Explain Big Endian and Little Endian methods of byte addressing. **(05 Marks)**

   b. Explain the following:
      (i) Three address instructions   (ii) Two address instructions
      (iii) One address instructions   (iv) Zero address instructions **(08 Marks)**

   c. What is an addressing mode? Registers R_1 and R_2 of a computer contain the decimal values 1400 and 5000. What is the effective address of the source operand in each of the following instructions?
      (i) Load 20(R_1), R_5 (ii) Move # 3000, R_5 (iii) Store 30(R_1, R_2), R_5
      (iv) Add (R_2)+, R_5 (v) Subtract –(R_1), R_5 **(07 Marks)**

Module-2

3 a. With neat diagram, explain interrupt operation. **(06 Marks)**

   b. What is DMA? Showing the possible register configurations in DMA interface. Explain DMA. **(07 Marks)**

   c. With neat timing diagram, explain synchronous input transfer. **(07 Marks)**

OR

4 a. Explain how interrupt requests from several IO devices can be communicated to a processor through a single INTR line. **(08 Marks)**

   b. With a neat block diagram, explain how a keyboard is connected to a processor. **(08 Marks)**

   c. Compare serial and parallel interface. **(04 Marks)**

1 of 2

Module-3

5 a. Explain the working of static RAM cell. (06 Marks)
b. With neat diagram explain the working of 16 Megabits DRAM chip configured as 2M × 8. (08 Marks)
c. With neat diagram, explain the memory hierarchy with respect to speed, size and cost. (06 Marks)

OR

6 a. Explain different types of ROMs. (06 Marks)
b. With neat diagram, explain the internal structure of ROM cell. (06 Marks)
c. With neat diagram, explain how virtual memory address translation takes place. (08 Marks)

Module-4

7 a. With neat diagram, explain 4-bit carry look ahead adder. (07 Marks)
b. Design a logic circuit to perform addition/subtraction of two 4 bit numbers X and Y. (06 Marks)
c. Perform multiplication for +14 and −6 using Booth's algorithm. (07 Marks)

OR

8 a. List out the actions needed to execute the instruction Add (R3), R1. Write the sequence of control steps needed for the execution of the same. Also explain. (10 Marks)
b. With neat block diagram, explain Hardwired Control Unit. (10 Marks)

Module-5

9 a. Explain Flynn's classification of computers. (06 Marks)
b. With neat diagram, explain attached array processor. (06 Marks)
c. Explain how the following expression is evaluated in pipelined mode:
$A_i * B_i + C_i$ for $i = 1, 2, ... 7$ (08 Marks)

OR

10 a. With neat diagram, explain SIMD array processor organization. (06 Marks)
b. With neat flow diagram, explain four-segment CPU pipeline. (10 Marks)
c. Write the sequence of operations for the following Do loop.
Do 20 I = 1, 100
20 C[I] = B[I] + A[I] (04 Marks)

* * * * *

2 of 2

CBCS SCHEME

21CS382

USN ☐☐☐☐☐☐☐☐☐☐ | Question Paper Version : A

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Programming in C++

Time: 1 hr.]   [Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.

2. Use only **Black ball point pen** for writing / darkening the circles.

3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**

4. Darkening two circles for the same question makes the answer invalid.

5. **Damaging/overwriting, using whiteners** on the OMR sheets are strictly prohibited.

---

1. C++ is _____
   a) procedural programming language
   b) object oriented programming language
   c) functional programming language
   d) both procedural and object oriented programming language

2. How structures and classes in C++ differ?
   a) In structures, embers are public by default whereas, in classes they are private by default
   b) In structure, members are private by default whereas, in classes they are public by default
   c) Structures by default hide every member whereas classes do not
   d) structure cannot have private members whereas classes can have

3. What does polymorphism in oops, mean?
   a) concept of allowing overriding of functions
   b) concept of hiding data
   c) concept of keeping things in different modules
   d) concept of wrapping things into a single unit

4. How many types of polymorphism are there in C++?
   a) 1   b) 2   c) 3   d) 4

5. Which of the following approach is used by C++?
   a) Top-down   b) Bottom-up   c) Left-right   d) Right – left

6. Which of the following is correct?
   a) A class is an instance of its objects
   b) An object is an instance of its class
   c) A class is an instanced of the data type that the class have
   d) An object is an instance of the data type of the class

7. Which of the following is not a fundamental type is not present in C but present in C++?
   a) int   b) float   c) boolean   d) void

8. What is the size of a Boolean variable in C++?
   a) 1 bit   b) 1 byte   c) 4 bytes   d) 2 types

9. Which is the following is the correct difference between cin and scanf( )?
   a) both are the same
   b) cin is a stream object whereas scanf( ) is a function
   c) scanf( ) is a stream object whereas cin is a function
   d) cin is used for printing whereas scanf( ) is used for reading input

10. Which of the following is an entry – controlled loop?
    a) for   b) while   c) do-while   d) both while and for

11. Data members and member functions of a class in C++ program are by default
    a) protected   b) public   c) private   d) none

12. Which operator is used to allocate an object dynamically of a class in C++?
    a) scope resolution operator
    b) conditional operator
    c) new operator
    d) membership operator

13. Which is used to define the member function of a class externally?
    a) :   b) ::   c) #   d) none

14. If you want to write multiple functions in a class with same name, then what C++ feature will you use?
    a) Function overriding
    b) Encapsulation
    c) Function overloading
    d) None

15. Polymorphism types is/are
    a) compile time   b) run time   c) both a and b   d) none

16. In C++ code, variables can be passed to a function by
    a) pass by value   b) pass by reference   c) pass by pointer   d) all of these

17. Constant function in C++ can be declared as
    a) void display( )
    b) void display( )const
    c) const void display( )
    d) void const display( )

18. Which fn can be called without using an object of a class in C++
    a) static function
    b) inline function
    c) friend function
    d) constant function

19. Which of the following fn declaration using default arguments is correct?
    a) int foo(int x, int y = 5, int z = 10)
    b) int foo(int x = 5, int y = 10, int z)
    c) int foo(int x = 5, int y, int z = 10)
    d) all are correct

20. Overloaded functions in C++ are
    a) Functions preceding with virtual keyword
    b) Functions inherited from base class to derived class
    c) Two or more functions having same name but different number of parameters
    d) none of these

21. When you create an object of a class A like A obj ; then which one will be called automatically
    a) constructor   b) destructor
    c) copy constructor   d) none of these

22. How many parameters does a default constructor required?
    a) 1   b) 2   c) 0   d) 3

23. What is the role of a constructor in class?
    a) To modify the data whenever required
    b) To destroy an object
    c) To initialize the data members of an object when it is created
    d) To call private functions from the outer world

Ver-A – 3 of 6

24. What is a copy constructor?
   a) A constructor that allows a user to move data from one object to another
   b) A constructor to initialize an object with the values of another object
   c) A constructor to check whether the object are equal or not
   d) A constructor to kill other copies of a given object

25. What happens if a user forgets to define a constructor inside a class?
   a) Error occurs
   b) Segmentation fault
   c) Objects are not created properly
   d) Compiler provides a default constructor to avoid errors

26. How many types of constructors are there in C++?
   a) 1   b) 2   c) 3   d) 4

27. What is the role of destructors in class?
   a) To modify the data wherever required
   b) To destroy an object when the lifetime of an object ends
   c) To initialize the data members of an object when it is crated
   d) To call private functions from the outer world

28. When you create an object of a derived class in C++
   a) Derived class constructor is called first, then the base class constructor
   b) Base class constructor is called first, then derived class constructor
   c) Base class constructor will not be called
   d) None of these

29. Which of the following shows multiple inheritances?
   a) A → B → C
   b) A →B ; A → C
   c) A, B → C
   d) B → A

30. Which of the following is not a type of inheritance?
   a) multiple
   b) multilevel
   c) distributive
   d) hierarchical

31. By default, all the files are opened in _____ mode
   a) Binary
   b) Text
   c) Image
   d) Video

26

32. Which of the following is not a file opening mode?
    a) iso : : ate
    b) ios : : nocreate
    c) ios : : noreplace
    d) ios : : truncate

33. If we have object form of stream class, then default mode of opening the file is
    a) ios : : in
    b) ios : : out
    c) ios : : in/ios : : trunc
    d) ios : : out/ios ; : trunk

34. _____ is return type of is-open( ) function
    a) int   b) boolean   c) float   d) char *

35. To create an output stream, we must declare the stream to be of class _____
    a) ofstream   b) ifstream   c) iostream   d) none of these

36. Streams that will be performing both input and output operations must be declared as class __
    a) iostream   b) fstream   c) stdstream   d) stdostream

37. To perform file i/o operations, we must use _____ header file
    a) <ifstream.h>   b) <ofstream.h>   c) <fstream.h>   d) none of these

38. Which of the following is not used to seek a file pointer?
    a) ios : : cur   b) ios : : set   c) ios : : end   d) ios : : beg

39. Which function is used in C++ to get the current position of the file pointer in a file?
    a) tell_p( )   b) get_pos( )   c) get_p( )   d) tell_pos( )

40. Which function is used to reposition the file pointer?
    a) moveg( )   b) seekg( )   c) changep( )   d) go_p( )

41. Which is used to handle the exceptions in C++?
    a) catch handler   b) handler
    c) exception handler   d) throw

42. Which type of program is recommended to include in try block?
    a) static memory allocation
    b) dynamic memory allocation
    c) const reference
    d) pointer

43. Which statement is used to catch all types of exceptions?
    a) catch( )   b) catch(Test t)   c) catch(...)   d) catch (Test)

44. Which illustrate predefined exceptions
    a) memory allocation error
    b) I/O error
    c) both a and b
    d) none of these

45. How many parameters does the throw expression has in C++?
    a) 1   b) 2   c) 3   d) 4

46. What is an exception in C++ program?
    a) A problem that arises during the execution of the program
    b) A problem that arises during compilation
    c) Also known as the syntax error
    d) Also known as semantic error

47. By default, what a program does when it detects an exception?
    a) continue running
    b) results in the termination of the program
    c) calls other functions of the program
    d) removes the exception and tells the programmer about the exception

48. Why do we need to handle exceptions?
    a) To avoid unexpected behavior of a program during run time
    b) To let complier remove all exceptions by itself
    c) To successfully compile the program
    d) To get correct output

49. How exception handling is implemented in C++?
    a) Using Exception keyword
    b) Using try-catch bock
    c) Using Exception block
    d) Using Error handling schedules

50. Which of the following is an exception in C++?
    a) Divide by zero
    b) Semicolon not written
    c) Variable not declared
    d) An expression is wrongly written.

* * * * *

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

21CS32

Third Semester B.E. Degree Examination, June/July 2024
Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. Write a program in C to demonstrate how whole structure is passed as a parameter to a function. **(04 Marks)**
   b. Define DMA. List and explain different DMA functions used in C. **(08 Marks)**
   c. Explain the representation of linear array in memory and give example. **(08 Marks)**

OR

2 a. Consider two polynomials $A(x) = 7X^{1000} + 4$ and $B(x) = x^4 + 5x^3 + 4x^2 + 3$. Show diagrammatically how these two polynomials can be stored in a single dimensional array. **(04 Marks)**
   b. Define polynomial and degree of the polynomial. Write the representation of polynomial using array and structures. **(08 Marks)**
   c. Write a program in C to read sparse matrix of integer values and to search the sparse matrix for an element specified by the user. **(08 Marks)**

Module-2

3 a. Define Stack. Give the C implementation of push and pop function. Include check for empty and full condition of stack. **(07 Marks)**
   b. Convert the following infix expression into prefix and postfix expressions:
      i) $((H * ((((A + ((B + C) * D)) * F) * G) * E)) + J)$
      ii) $A/B - C + D * E - A * C$ **(08 Marks)**
   c. Write a program in c to implement tower of Hanoi using recursive function. **(05 Marks)**

OR

4 a. Write a function in c to add, delete and display the elements from queue. **(07 Marks)**
   b. Write a program in c to implement the operations on a circular queue using dynamically allocated arrays. **(08 Marks)**
   c. What is priority queue? Briefly explain the types of priority queues. **(05 Marks)**

Module-3

5 a. Write a program in C to implement Stack operations using single linked list. **(07 Marks)**
   b. Write a program in C to implement Queue operations using single linked list. **(08 Marks)**
   c. Write a program in C to count the number of nodes in a single linked list. **(05 Marks)**

OR

6 a. Write a program in C to implement insert front, delete front and display functions using double linked list. **(07 Marks)**

1 of 2

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b. Write a linked representation for the given sparse matrix.

$$A = \begin{bmatrix} 2 & 0 & 0 & 3 \\ 0 & 0 & 5 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 8 \\ 0 & 7 & 4 & 0 \end{bmatrix}$$

Fig.Q.6(b)

(08 Marks)

c. Differentiate between single linked list and double linked list. (05 Marks)

Module-4

7 a. Define binary tree and state its properties. Show how binary tree is represented using an array and linked list. (08 Marks)

b. Write the binary tree for the expression A/B * C * D + E. Write the result of preorder and post order traversals for the given expression. (07 Marks)

c. Write the algorithm for preorder and post order traversals. (05 Marks)

OR

8 a. Define Threaded Binary Tree. Write the memory representation of Threaded Binary Tree for the given graph. (08 Marks)
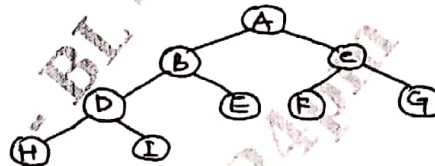

Fig.Q.8(a)

b. Draw the binary search tree for the following inputs and write recursive function to search for a given key value.

13 4 7 3 17 21 15 19 2 23

(07 Marks)

c. Write the applications of trees. (05 Marks)

Module-5

9 a. Define graph. What are the different methods of representing a graph? Give example. (10 Marks)

b. Define the following with an example:
   i)   Directed graph
   ii)   Multigraph
   iii) Complete graph
   iv)   Cyclic and acyclic graph
   v)   Loop. (10 Marks)

OR

10 a. Define BFS with an example. Write a function in C to implement BFS. (10 Marks)

b. What is Hashing? Briefly explain the different types of hashing techniques. Construct the hash table for storing C built-in functions,
acos, define, float, exp, char, atan, ceil, floor
Note: Use hash table with 26 buckets and 2 slots per bucket. (10 Marks)

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2 of 2

CBCS SCHEME

USN | | | | | | | | | | | **BCS401**

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
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.

|			M	L	C
Module – 1					
Q.1	a.	What is an algorithm? Explain the fundamentals of algorithmic problem solving.	10	L2	CO1
	b.	Develop an algorithm to search an element in an array using sequential search. Calculate the best case, worst case and average case efficiency of this algorithm.	10	L3	CO1
OR					
Q.2	a.	Explain asymptotic notations with example.	10	L2	CO1
	b.	Give the general plan for analyzing the efficiency of the recursive algorithm. Develop recursive algorithm for computing factorial of a positive number. Calculate the efficiency in terms of order of growth.	10	L3	CO1
Module – 2					
Q.3	a.	Explain Strassen's matrix multiplication approach with example and derive its time complexity.	10	L3	CO2
	b.	What is divide and conquer? Develop the quick sort algorithm and write its best case. Make use of this algorithm to sort the list of characters: E, X, A, M, P, L, E.	10	L2	CO2
OR					
Q.4	a.	Distinguish between decrease & conquer and divide & conquer algorithm design techniques with block diagram. Develop insertion sort algorithm to sort a list of integers and estimate the efficiency.	10	L3	CO2
	b.	Define topological sorting. List the two approaches of topological sorting and illustrate with examples.	10	L2	CO2
Module – 3					
Q.5	a.	Define AVL tree with an example. Give worst case efficiency of operations on AVL tree. Construct an AVL tree of the list of keys: 5, 6, 8, 3, 2, 4, 7 indicating each step of key insertion and rotation.	10	L3	CO3
	b.	Define Heap. Explain the bottom-up heap construction algorithm. Apply heap sort to sort the list of numbers 2, 9, 7, 6, 5, 8 in ascending order using array representation.	10	L3	CO3
OR					
Q.6	a.	Define 2-3 tree. Give the worst case efficiency of operations on 2-3 tree. Build 2-3 tree for the list of keys 9, 5, 8, 3, 2, 4, 7 by indicating each step of key insertion and node splits.	10	L3	CO3
	b.	Design Horspool algorithm for string matching. Apply this algorithm to find the pattern BARBER in the text: JIM_SAW_ME_IN_A_BARBERSHOP	10	L3	CO3
Module – 4					
Q.7	a.	Apply Dijkstra's algorithm to find the single source shortest path for given graph [Fig.Q7(a)] by considering 's' as source vertex. Illustrate each step.	10	L3	CO4
1 of 2					

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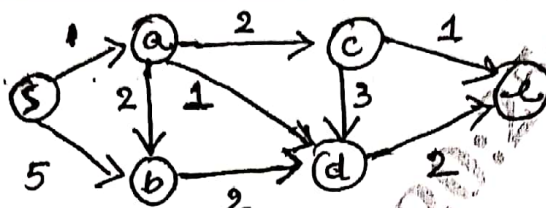
Fig.Q7(a)

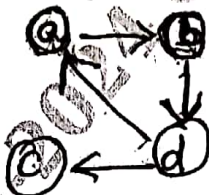|					
	b.	Define transitive closure. Write Warshall's algorithm to compute transitive closure. Illustrate using the following directed graph.	10	L3	CO4

Fig.Q7(b)

OR

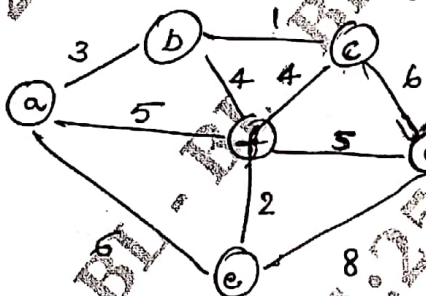|					
Q.8	a.	Define minimum spanning tree. Write Kruskal's algorithm to find minimum spanning tree. Illustrate with the following undirected graph.	10	L3	CO4

Fig.Q8(a)

	b.	Construct Huffman Tree and resulting code for the following:	10	L3	CO4

Character	A	B	C	D	E
Probability	0.4	0.1	0.2	0.15	0.15

(i) Encode the text : ABACABAD
(ii) Decode the text : 100010111001010

Module – 5

Q.9	a.	Explain n-Queen's problem with example using backtracking approach.	10	L2	CO5
	b.	Solve the following instance of the knapsack problem by the branch-and-bound algorithm. Construct state-space tree.	10	L3	CO5

Item	Weight	Value
1	4	$ 40
2	7	$ 42
3	5	$ 25
4	3	$ 12

The knapsack's capacity W is 10.

OR

Q.10	a.	Differentiate between Branch and Bound technique and Backtracking. Apply backtracking to solve the following instance of subset-sum problem S = {3, 5, 6, 7} and d = 15. Construct a state space tree.	10	L3	CO5
	b.	Explain greedy approximation algorithm to solve discrete knapsack problem.	10	L2	CO5

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BCS402

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Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Microcontrollers

Time: 3 hrs.   Max. Marks: 100

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

			M	L	C
Module – 1					
Q.1	a.	Explain the architecture of an arm embedded device with a neat diagram.	10	L2	CO1
	b.	How are monitor and control internal operations performed in ARM core? Explain in brief.	10	L2	CO1
OR					
Q.2	a.	Explain memory management in ARM core. Compare cache and tightly coupled memory.	10	L2	CO1
	b.	Explain mechanism applied by ARM core to handle exception, interrupts using different vector table.	10	L2	CO1
Module – 2					
Q.3	a.	Examine data processing instructions requirement in the manipulation of data register? Explain in brief data processing instructions.	10	L2	CO2
	b.	Explain with examples the following 32-bit instruction of ARN processor i) CMN ii) MLA iii) MRS iv) BIC v) LDR.	10	L2	CO2
OR					
Q.4	a.	Explain the following with example : i) Stock operation ii) Swap instructions.	10	L2	CO2
	b.	Explain Branch instructions in ARM with suitable example. Demonstrate Branch instruct usage flow of execution with an example program.	10	L2	CO2
Module – 3					
Q.5	a.	How registers are allocated to optimize the program? Develop an assembly level program to find the sum of first to integer numbers.	10	L2	CO3
	b.	How complier handles a "for loop" with variable number of iterations N and loop controlling with an example.	10	L2	CO3
OR					
Q.6	a.	Explain the following terms with an appropriate example : i) Pointer Aliasing ii) Portability issues.	10	L2	CO3
	b.	How function calling is efficiently used by ARM through APCS with an example program.	10	L2	CO3
Module – 4					
Q.7	a.	Explain ARM processors exception and modes with a neat diagram.	10	L2	CO4
	b.	Explain exception priorities and link register offset.	10	L2	CO4
OR					
Q.8	a.	List ARM firmware suite features. Explain firmware execution flow and Red Hat Boot.	10	L2	CO4
	b.	Explain IRQ and Fir exception, also to enable and disable IRQ and FIQ interrupts.	10	L2	CO4
Module – 5					
Q.9	a.	Explain basic architecture of cache memory.	10	L2	CO5
	b.	Explain process involved in main memory mapping to a cache memory.	10	L2	CO5
OR					
Q.10	a.	Explain with diagram set associative cache. How are efficiency is measured?	10	L2	CO5
	b.	Briefly explain cache line replacement policies with an example.	10	L2	CO5

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Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Database Management Systems

Time: 3 hrs.   Max. Marks: 100

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

		Module – 1	M	L	C
Q.1	a.	Define database. Elaborate component modules of DBMS and their interactions.	10	L2	CO1
	b.	Describe the three-schema architecture. Why do we need mappings among schema levels?	06	L2	CO1
	c.	Explain the difference between logical and physical data independence.	04	L2	CO1
		OR			
Q.2	a.	Draw an ER diagram for an COMPANY database with employee, department, project as strong entities and dependent as weak entity. Specify the constraints, relationships and ratios in the ER diagram.	10	L3	CO3
	b.	Define the following terms with example for each using ER notations: Entity, attribute, composite attribute, multivalued attribute, participation role.	10	L3	CO3
		Module – 2			
Q.3	a.	Discuss the update operations and dealing with constraint violations with suitable examples.	08	L2	CO2
	b.	Illustrate the relational algebra operators with examples for select and project operation.	06	L2	CO2
	c.	Discuss the characteristics of relations that make them different from ordinary table and files.	06	L2	CO2
		OR			
Q.4	a.	Perform (i) Student U instructor (ii) Student ∩ Instructor (iii) Student – Instructor (iv) Instructor – Student on the following tables:	04	L3	CO2
	b.	Consider the following relational database schema and write the queries in relational algebra expressions:	10	L3	CO2

Q.4 a. tables:

Student

Fname	Lname
Susan	Yao
Ramesh	Shah
Johnny	Kohler
Barbara	Jones
Amy	Ford
Jimmy	Wang
Ernest	Gilbert

Instructor

Fname	Lname
John	Smith
Ricardo	Browne
Susan	Mao
Francis	Johnson
Ramesh	Shah

Q.4 b.
EMP(Eno, Ename, Salary, Address, Phone, DNo)
DEPT(DNo, Dname, DLoc, MgrEno)
DEPENDENT(Eno, Dep_Name, Drelation, Dage)
   (i)   List all the employees who reside in 'Belagavi'.
   (ii)   List all the employees who earn salary between 30000 and 40000
   (iii)   List all the employees who work for the 'Sales' department
   (iv)   List all the employees who have at least one daughter
   (v)   List the department names along with the names of the managers

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	c.	Consider the two tables T₁ and T₂ shown below:	06	L3	C

T_1

P	Q	R
10	a	5
15	b	8
25	a	6

T_2

A	B	C
10	b	6
25	c	3
10	b	5

Show the results of the following operations:

(i) $T_1 \bowtie_{T_1.P=T_2.A} T_2$

(ii) $T_1 \bowtie_{T_1.Q=T_2.B} T_2$

(iii) $T_1 \bowtie_{(T_1.P=T_2.A \ AND \ T_1.R=T_2.C)} T_2$

Module – 3					
Q.5	a.	Discuss the informal design guidelines for relation schema design.	08	L2	CO4
	b.	Define 1NF, 2NF, and 3NF with examples.	06	L2	CO4
	c.	Write the syntax for INSERT, UPDATE and DELETE statements in SQL and explain with suitable examples.	06	L2	CO3
OR					
Q.6	a.	Discuss insertion, deletion and modification anomalies. Why are they considered bad? Illustrate with examples.	10	L2	CO3
	b.	Illustrate the following with suitable examples: (i) Datatypes in SQL (ii) Substring Pattern Matching in SQL.	10	L2	CO3
Module – 4					
Q.7	a.	Consider the following relations: Student(<u>Snum</u>, Sname, Branch, level, age) Class(<u>Cname</u>, meet_at, room, fid) Enrolled(<u>Snum</u>, <u>Cname</u>) Faculty(<u>fid</u>, fname, deptid) Write the following queries in SQL. No duplicates should be printed in any of the answers. (i) Find the names of all Juniors (level = JR) who are enrolled in a class taught by I. Teach. (ii) Find the names of all classes that either meet in room R128 or have five or more students enrolled. (iii) For all levels except JR, print the level and rthe average age of students for that level. (iv) For each faculty member that has taught classes only in room R128, print the faculty member's name and the total number of classes she or he has taught. (v) Find the names of students not enrolled in any class.	10	L3	CO3
	b.	What do understand by correlated Nested Queries in SQL? Explain with suitable example.	04	L2	CO3
	c.	Discuss the ACID properties of a database transaction.	06	L2	CO4
OR					
Q.8	a.	What are the views in SQL? Explain with examples.	04	L3	CO5
	b.	In SQL, write the usage of GROUP BY and HAVING clauses with suitable examples.	06	L2	CO3
	c.	Discuss the types of problems that may encounter with transactions that run concurrently.	10	L2	CO5

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		Module – 5			
Q.9	a.	What is the two phase locking protocol? How does it Guarantee serializability.	06	L2	CO5
	b.	Describe the wait-die and wound-wait protocols for deadlock prevention.	08	L2	CO5
	c.	List and explain the four major categories of NOSQL system.	06	L2	CO3
		OR			
Q.10	a.	What is Multiple Granularity locking? How is it implemented using intension locks? Explain.	10	L2	CO5
	b.	Discuss the following MongoDB CRUD operations with their formats: (i) Insert (ii) Delete (iii) Read	06	L2	CO4
	c.	Briefly discuss about Neo4j data model.	04	L2	CO4

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BCS405A

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Discrete Mathematical Structures

Time: 3 hrs.

Max. Marks: 100

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

		Module – 1	M	L	C
Q.1	a.	Define tautology. Prove that for any propositions p, q, r the compound proposition. $[(p \wedge \neg q) \rightarrow r] \rightarrow [p \rightarrow (q \vee r)]$ is a tautology	06	L2	CO1
	b.	Test whether the following is a valid argument: If Ram studies then he will pass 12th. If Ram passes 12th then his father gifts him a bike. If Ram doesn't play video game then he will pass 12th. Ram did not get a bike. ∴ Ram played video game.	07	L3	CO1
	c.	Give direct proofs of the statements: i) If k and l are odd then k + l is even. ii) If k and l are odd then kl is odd.	07	L2	CO1
		OR			
Q.2	a.	Define (i) Proposition (ii) Open statement (iii) Quantifiers	06	L2	CO1
	b.	Using the laws of logic, prove the following logical equivalence: $[(\neg p \vee \neg q) \wedge (F_0 \vee p) \wedge p] \Leftrightarrow p \wedge \neg q$	07	L2	CO1
	c.	Write the following statement in symbolic form and find its negation: "If all triangles are right angled then no triangle is equilateral".	07	L2	CO1
		Module – 2			
Q.3	a.	Prove by using mathematical induction. $1^2 + 2^2 + \ldots + n^2 = \dfrac{n(n+1)(2n+1)}{6}$	06	L2	CO1
	b.	How many words can be made with or without meaning from the letters of the word "STATISTICS"? In how many of these a and c are adjacent? In how many vowels are together?	07	L3	CO2
	c.	Find the coefficient of $x^3 y^8$ in the expansion of $(2x - y)^{11}$.	07	L2	CO2
		OR			
Q.4	a.	Obtain the recursive definition for the sequence in each of the following cases: (i) $a_n = 5n$ (ii) $a_n = 3n + 7$ (iii) $a_n = n^2$ (iv) $a_n = 2 - (-1)^n$	06	L2	CO2
	b.	A woman has 11 close relations and wishes to invite 5 of them to dinner. In how many ways can she invite them if (i) there is no restriction on her choice. (ii) 2 persons will not attend separately (iii) 2 persons will not attend together.	07	L3	CO2
	c.	In how many ways can we distribute 7 apples and 5 oranges among 3 children such that each child gets atleast one apple and one orange?	07	L3	CO2

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		Module – 3			
Q.5	a.	State pigeon hole principle. Using pigeon hole principle find the minimum number of persons chosen so that atleast 5 of them will have their birthday in the same month.	06	L3	CO3
	b.	Let A = {a, b, c, d} and B = {1, 2, 3, 4, 5}. Find the number of 1-1 functions and onto functions from (i) A to B (ii) B to A	07	L2	CO3
	c.	Let A = {1, 2, 3, 4, 5}. Define a relation R on A × A by $(x_1, y_1) R (x_2, y_2)$ iff $x_1 + y_1 = x_2 + y_2$. (i) Verify that R is an equivalence relation (ii) Determine the equivalence class of [(2, 4)]	07	L2	CO3
		OR			
Q.6	a.	Consider the functions f and g from R to R defined by f(x) = 2x + 5 and g(x) = ½ (x – 5). Prove that g is inverse of f.	06	L2	CO3
	b.	Let A = {1, 2, 3, 4} and R be the relation on A defined by xRy if and only if x < y. Write down R as a set of ordered pairs. Write the relation matrix and draw the digraph. List out the in degrees and out degrees of every vertex.	07	L2	CO3
	c.	Let A = {1, 2, 3, 6, 9, 12, 18} and define R on A by xRy iff 'x divides y'. Prove that (A, R) is a POSET. Draw the Hasse diagram for (A, R).	07	L2	CO3
		Module – 4			
Q.7	a.	How many integers between 1 and 300 (inclusive) are divisible by (i) atleast one of 5, 6 or 8. (ii) None of 5, 6 and 8.	06	L3	CO4
	b.	At a restaurant 10 men handover their umbrellas to the receptionist, In how many ways can their umbrellas be returned so that (i) no man receives his own umbrella. (ii) atleast one gets his own umbrella. (iii) atleast two gets their own umbrellas.	07	L3	CO4
	c.	The number of virus affected files in a system is 1000 (to start with) and this increases by 250% every 2 hours. Use a recurrence relation to determine the number of virus affected files in the system after 12 hours.	07	L3	CO4
		OR			
Q.8	a.	In how many ways one can arrange the letters of the word "CORRESPONDENTS" so that there are (i) no pair (ii) atleast 2 pairs of consecutive identical letters.	06	L3	CO4
	b.	4 persons P_1, P_2, P_3, P_4 who arrive late for a dinner party find that only one chair at each of five tables T_1, T_2, T_3, T_4 and T_5 is vacant. P_1 will not sit at T_1 or T_2. P_2 will not sit at T_2. P_3 will not sit at T_3 or T_4. P_4 will not sit at T_4 or T_5. Find the number of ways they can occupy the vacant chairs.	07	L3	CO4
	c.	Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$ for n ≥ 2 with $a_0 = 5$, $a_1 = 12$.	07	L2	CO4
		Module – 5			
Q.9	a.	If * is an operation on Z defined by x*y = x + y + 1, prove that (Z, *) is an abelian group.	06	L2	CO5
	b.	Explain Klein-4 group with example.	07	L2	CO5
	c.	State and prove Lagrange's theorem.	07	L2	CO5
		OR			
Q.10	a.	Prove that intersection of two subgroups of a group G is also a subgroup of G.	06	L2	CO5
	b.	Prove that (Z_4, +) is a cyclic group. Find all its generators.	07	L2	CO5
	c.	Let G = S_4 for $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{pmatrix}$ Find the subgroup H = <α> determine the left cosets of H in G.	07	L3	CO5

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CBCS SCHEME

BAD402

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Artificial Intelligence

Time: 3 hrs.   Max. Marks: 100

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

		Module – 1	**M**	**L**	**C**
Q.1	a.	Define Artificial Intelligence. Explain the foundation of AI in detail.	10	L1	CO1
	b.	Explain all four different approaches to AI in detail.	10	L1	CO1
		OR			
Q.2	a.	Give PEAS specification for : i) Automated taxi driver ii) Medical diagnostic system.	10	L1	CO1

	b.	Differentiation :
		   i) Fully observable Vs partially observation
		   ii) Single agent Vs Multiagent
		   iii) Deterministic Vs stochastic
		   iv) Static Vs Dynamic.
			10	L1	CO1

		Module – 2			
Q.3	a.	Explain five components and well defined problem. Consider an 8-puzzle problem as an example and explain.	10	L2	CO2
	b.	Discuss in detail in Infrastructure for search algorithm.	10	L2	CO2
		OR			
Q.4	a.	Write an algorithm for Breadth – first search and explain with an example.	10	L2	CO2
	b.	Explain Depth first search techniques in detail.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the A* search to minimize the total estimated cost.	10	L3	CO3
	b.	Write an algorithm for hill climbing search and explain in detail.	10	L3	CO3
		OR			
Q.6	a.	In the below graph, find the path from A to G. Using Greedy Best First search and A* search algorithm. The values in the table represent heuristic values of reaching the goal node G pass current node.	10	L3	CO3

A	5
B	6
C	4
D	3
E	3
F	1
G	0

Fig Q6(a)

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	b.	Explain the syntax and semantion of propositional logic.	10	L3	CO3
		Module – 4			
Q.7	a.	Explain the syntax and semantics of the first order logic.	10	L2	CO2

	b.	Explain the following with respect to the first order logic
		  i) Assertions and Queries in first order logic
		  ii) The Kinship domain
		  iii) Numbers, sets and lists.
			10	L2	CO2

		OR			
Q.8	a.	Explain unification and lifting in detail.	10	L3	CO4
	b.	Explain Forward chaining algorithm with an example.	10	L3	CO4
		Module – 5			
Q.9	a.	Explain basic probability Notation in detail.	10	L3	CO5
	b.	Explain Baye's rule and its use in detail.	10	L3	CO5
		OR			
Q.10	a.	Explain Independence in Quantifying uncertainty with example.	10	L3	CO5
	b.	Explain knowledge Acquiting in detail.	10	L3	CO5

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BIS402

Fourth Semester B.E./B.Tech.Degree Examination, June/July 2024
Advanced Java

Time: 3 hrs.

Max. Marks: 100

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

		Module – 1	M	L	C
Q.1	a.	What is collection Frame Work? Explain the methods defined by the following Interfaces: (i) Collection (ii) List (iii) Sorted Set (iv) Queue	10	L2	CO1
	b.	What are Legacy Classes? Explain any four legacy classes of Java's collection Frame work with suitable program.	10	L2	CO1
		OR			
Q.2	a.	Explain how collectors can be accessed using an iterator with example.	5	L3	CO1
	b.	What are the various changes that collection framework underwent recently?	5	L1	CO1
	c.	With an example program, explain how to store user-defined classes in collections.	10	L2	CO1
		Module – 2			
Q.3	a.	Explain any two character extraction methods of string class.	5	L2	CO2
	b.	Explain the various string constructors used in Java with examples.	10	L2	CO2
	c.	Explain additional string methods.	5	L2	CO2
		OR			
Q.4	a.	Briefly describe special string operations with syntax and examples.	5	L2	CO2
	b.	Explain the following methods of string buffer class with examples : (i) capacity ( ) (ii) reverse ( ) (iii) insert (iv) append ( )	10	L2	CO2
	c.	Explain any four string modification methods of string class.	5	L2	CO2
		Module – 3			
Q.5	a.	Explain the four types of the swing buttons, with demonstration program.	10	L3	CO3
	b.	Explain MVC connector Architecture.	5	L2	CO3
	c.	What are the two key swing features? Discuss.	5	L1	CO3
		OR			
Q.6	a.	Explain the following : (i) JLabel and Image Icon (ii) JTextField	10	L2	CO3
	b.	Write a program to demonstrate a simple swing application.	10	L3	CO3
		Module – 4			
Q.7	a.	Explain the life cycle of Servlets.	5	L2	CO4
	b.	Describe the core interfaces that are provided in Jakarta (Javax), Servlet, http package.	5	L2	CO4
	c.	Define JSP. Explain the different types of JSP tags by taking suitable example.	10	L2	CO4
		OR			

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Q.8	a.	Explain any two cookies method.	5	L1	CO4
	b.	With a code, explain how to handle HTTP get requests and HTTP post requests.	10	L2	CO4
	c.	Explain how cookies can be handled using servlets.	5	L4	CO4
Module – 5					
Q.9	a.	Explain different steps involved in JDBC process with a code snippet.	10	L3	CO5
	b.	List and elaborate Database Metadata Object methods.	5	L2	CO5
	c.	List and explain three kinds of exception occurred in JDBC.	5	L2	CO5
OR					
Q.10	a.	Mention all steps to create the association between the database and a JDBC/ODBC bridge.	12	L3	CO5
	b.	Explain the four types of JDBC drivers.	8	L2	CO5

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CBCS SCHEME

BCS456C

Question Paper Version : D

Fourth Semester B.E. Degree Examination, June/July 2024
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. The purpose of wire framing in UI/UX design is to _____
   a) to create a final polished design
   b) to communicate layout and functionality
   c) to select color schemes
   d) to add animations

2. UX measure is _____
   a) Usage of your interaction design
   b) Usage of conceptual design
   c) Usage of design thinking
   d) Usage of ideations

3. Measuring instrument is a description of _____
   a) Providing values for the particular UX measure
   b) Providing values for the UX targets
   c) Providing values for the UX metrics
   d) Providing values for UX goals.

4. Detailed design includes _____
   a) Visual frames
   b) Visual clips
   c) Visual comps
   d) Visual wire frames

5. Bread and butter tool of interaction design is _____
   a) Sketching
   b) Wireframes
   c) Detailed design
   d) None of these

6. In which software tool is used in wireframe _____
   a) Adobe XD
   b) Keil
   c) Xlinx
   d) None of these

7. Subjective of the UX design is _____
   a) UX metrics
   b) UX goals
   c) UX measure
   d) UX target

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8. Quantitative statement is _____
   a) UX metrics   b) UX goals   c) UX measure   d) UX target

9. Wire frames are _____ frames
   a) Low fidelity wire frames   b) High fidelity wireframes
   c) Median fidelity wireframes   d) None of these

10. The drawing aspects of wireframes are user of _____ boxes
    a) Square boxes   b) Paralleogram boxes
    c) Rectangular boxes   d) None of these

11. Some of the guidelines and much of practical user performance depend on
    a) The concepts of over satisfaction   b) The concepts of UX guidelines
    c) The concepts of human working memory   d) All of these

12. Sensory memory is of _____
    a) Small brief duration   b) Large brief duration
    c) Very brief duration   d) None of these

13. The selected UX design guidelines are generally organized by the _____
    a) UAF structure   b) API structure
    c) GUI structure   d) All of these

14. Design examples of UX guidelines from everyday things such as
    a) Hair dryers   b) Automobiles
    c) Public doorways   d) All of these

15. Planning guidelines are the support _____
    a) Users   b) Servants   c) Public   d) None of these

16. User actions to determine _____
    a) When tasks or steps to do   b) What tasks or steps to do
    c) How tasks or step to do   d) Why tasks or steps to do

17. Translation guidelines are to support _____
    a) Users   b) Customers   c) Peoples   d) None of these

18. Including human memory support in the task structure _____
    a) Design simplicity   b) Flexibility
    c) Efficiency   d) Concurrency

19. Physical actions guidelines support users is doing physical actions including _____
    a) Typing
    b) Clicking
    c) Dragging in a GUI, scrolling on a web page
    d) All of these

20. The outcomes part of the interaction cycle is about supporting _____
    a) Users through complete and correct "backend" functionality
    b) User's interaction cycle functionality
    c) Dragging in a GUI, scrolling on a web page functionality
    d) All of these

21. A sense is a design representation is
    a) Interaction design
    b) Wire frame
    c) Prototype
    d) Design thinking

22. The ideas of prototyping is _____
    a) Timeless and universal
    b) Build and real thing
    c) Choice and approach
    d) all of these

23. Which prototype is demonstrating the product concept and for conveying an early product overview?
    a) Vertical prototype
    b) Upper prototype
    c) Horizontal prototype
    d) None of these

24. In which prototype combines the advantages of both horizontal and vertical, offering a good compress for system evaluation?
    a) 'R' prototype
    b) 'Y' prototype
    c) 'T' prototype
    d) 'D' prototype

25. A vertical prototype is associated with _____
    a) User actions, in depth
    b) Customer actions, in depth
    c) Stake holder actions in depth
    d) All of these

26. Prototype that are not faithful representations of the details of look, feel and behavior is _____
    a) Vertical prototype
    b) Local prototype
    c) Horizontal prototype
    d) Low fidelity prototype

27. In which prototype are more detailed representation of designs _____
    a) High fidelity prototype
    b) Local prototype
    c) Horizontal prototype
    d) Low fidelity prototype

28. Which one of the fidelity is not independent _____
    a) Interactivity of prototype
    b) Local prototype
    c) Horizontal prototype
    d) Low fidelity prototype

29. Paper prototype can act as _____
    a) Coding blocker
    b) View blocker
    c) Prototype blocker
    d) All of these

30. A 'T' prototype combines _____
    a) Both paper and local prototype
    b) Both horizontal and local prototype
    c) Both low fidelity and high fidelity
    d) None of these

31. Design concept includes _____
    a) Usability
    b) Accessibility
    c) Both (a) and (b)
    d) None of these

32. _____ is a human centered approach to problems solving that emphasizes empathy, creativity and collaboration.
    a) Design
    b) Design thinking
    c) User perspectives
    d) User collaboration

33. Generation of new idea is _____
    a) Critiquing
    b) Designing
    c) Idea creation
    d) Sketching

Ver-D 3 of 5

34. Interaction perspective is _____
    a) How the system work
    b) How the user operate the system
    c) How the system communicate
    d) How a system interface

35. The long term design documentation is _____
    a) Sketching
    b) Design
    c) Drawing
    d) ideation

36. Critiquing is about _____
    a) Review and judgment
    b) Joy and enjoyment
    c) Idea creation
    d) Theme or ideas

37. Rapid creation of freehand drawing is _____
    a) Drawing
    b) Sketching
    c) Designing
    d) Intellectual drawing

38. Story board is a sequence of _____
    a) Frame clips
    b) Visual frames
    c) Sketches
    d) Graphics frames

39. Ideation is an _____
    a) Active
    b) Fast moving
    c) Collaboration
    d) All of these

40. Use mental model is a description of _____
    a) How the system work
    b) Explanation of someone's thought
    c) Something works in the real world
    d) None of these

41. Usability is an established, as a part of the _____
    a) Technology World
    b) Computation World
    c) Designer's World
    d) None of these

42. Example of extracting a requirement statement for _____
    a) Ticket Kiosk system
    b) Software system
    c) Website design system
    d) All of these

43. The term translate each user need into one or more introduction design that is _____
    a) Extracting statement
    b) Requirement statement
    c) Requirement structure
    d) Terminology statement

44. What UX encompasses of _____
    a) Only visual elements
    b) Only functional element
    c) Both visual and functional element
    d) Either visual nor functional element

45. A business – a – case a user experience typically includes
    a) Technical specification of the product
    b) Analysis of competitor pricing strategies
    c) Justification of investment based on quotation of ROI
    d) Historical data on employee turn over rate.

46. The primary goal of UI design is to _____
    a) To maximize user satisfaction and usability
    b) To optimize loading times
    c) To minimize user engagement
    d) All of these

Ver-D 4 of 5

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47. Which of the following is not a usability principle?
   a) Learn ability
   b) Efficiency
   c) Memorability
   d) Cost-effectiveness

48. In concern to design UI stands for _____
   a) User involvement
   b) User interface
   c) User interaction
   d) User inspection

49. The difference between UI and UX is/are:
   a) UI focuses on virtual elements, while UX focuses on functionality and user satisfaction
   b) UI and UX are interchangeable terms
   c) UI focuses on functionality, while UX focuses on elements
   d) UI focus on functionality, while UX focuses on user satisfaction

50. Emotional impact is user experience design refers to:
   a) The psychological effects of color choices on users
   b) How user feel when they interact with a product or service
   c) The technical performance of the website or app
   d) The number of features available to users.

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BBOC407

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2024
Biology for Engineers (CSE)

Time: 3 hrs.

Max. Marks: 100

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

		Module – 1	M	L	C
Q.1	a.	Discuss the various components of Eukaryotic cells.	10	L3	CO1
	b.	Identify the applications of stem cells.	5	L2	CO1
	c.	Explain the functions of vitamins.	5	L2	CO1
		OR			
Q.2	a.	Compare Prokaryotic and Eukaryotic cells.	10	L3	CO1
	b.	Explain the properties of Carbohydrates.	5	L2	CO1
	c.	Explain the functions of Lipids.	5	L2	CO1
		Module – 2			
Q.3	a.	Highlighting the properties of cellulose, justify cellulose as an effective water filter.	10	L3	CO1
	b.	Explain the working and development of DNA vaccines by taking suitable example.	10	L2	CO1
		OR			
Q.4	a.	What are Bioplastics? Justify the use of PHA as Bioplastic mentioning its properties and applications.	10	L3	CO1
	b.	Discuss the following : (i) Meat analogs of protein. (ii) Lipids as cleaning agents.	10	L2	CO1
		Module – 3			
Q.5	a.	What is Electro Encephalogram (EEG)? Discuss the types of Brain activity detected with EEG. Write any three applications.	10	L3	CO2
	b.	What are Pace Makers? Explain basic design and construction of Pace Makers.	10	L2	CO2
		OR			
Q.6	a.	Justify Lungs as purification system.	10	L3	CO2
	b.	Explain architecture of Rod and Core cells with suitable diagram.	10	L2	CO2
		Module – 4			
Q.7	a.	What is ultrasonography? Explain the uses and working principle.	10	L2	CO3
	b.	What is lotus leaf effect? Explain the mechanism and applications of super Hydrophobic effect.	10	L2	CO3
		OR			
Q.8	a.	The structure and design of Kingfisher beak lead to the design of Bullet trains. Explain.	10	L2	CO3
	b.	Explain the working and applications of Bionic Leaf Technology.	10	L2	CO3

1 of 2

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		Module – 5			
Q.9	a.	Explain the use of Electrical tongue in food science.	10	L2	CO4
	b.	Explain the advantages and limitations of Artificial Intelligence for disease diagnosis.	10	L2	CO4
		OR			
Q.10	a.	Explain Bioengineering solutions for muscular dystrophy and Osteroporosis.	10	L2	CO4
	b.	Explain most commonly used Bioprinting Techniques.	10	L2	CO4

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Fifth Semester B.E. Degree Examination, June/July 2024
Management and Entrepreneurship for IT Industry

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　Max. Marks: 100

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

Module-1

1　a. Explain management and discuss the functional areas of management. **(08 Marks)**
　b. Explain the steps involved in planning. **(06 Marks)**
　c. Discuss the staff selection process in detail **(06 Marks)**

OR

2　a. Bring out the nature of management and discuss the various roles of a manager. **(08 Marks)**
　b. List the types of organizations and explain any two highlighting its advantages and disadvantages. **(06 Marks)**
　c. Compare and contrast strategic and tactical planning. **(06 Marks)**

Module-2

3　a. Explain different leadership styles with their merits and demerits. **(08 Marks)**
　b. Discuss the characteristics and importance of coordination. **(06 Marks)**
　c. Discuss Hertzberg's two factors theory. **(06 Marks)**

OR

4　a. Explain motivation. Discuss Maslow's need hierarchy theory of motivation. **(08 Marks)**
　b. Explain controlling and discuss the steps in controlling. **(06 Marks)**
　c. Explain the importance of communication. **(06 Marks)**

Module-3

5　a. Discuss the different types of entrepreneurs in detail. **(10 Marks)**
　b. Explain financial and technical feasibility study. **(10 Marks)**

OR

6　a. Explain the stages of entrepreneurial process in detail. **(10 Marks)**
　b. Discuss the role of entrepreneurs in the economic development of the country and list the barriers to entrepreneurship. **(10 Marks)**

Module-4

7　a. Explain the significance of project report and list down the planning commission guidelines for project report preparation. **(08 Marks)**
　b. Illustrate the functional areas of operation of management – Marketing and sales and supply chain management. **(06 Marks)**
　c. Write a note on project identification with sources. **(06 Marks)**

OR

8　a. Discuss the various contents of project report. **(08 Marks)**
　b. Illustrate the functional areas of operation of management – Accounting and finance and human resources. **(06 Marks)**
　c. Write a note on project selection. **(06 Marks)**

1 of 2

Module-5

9 a. Discuss the steps involved in establishing micro and small enterprise. **(08 Marks)**
   b. Discuss the case study of Infosys (N R Narayana Murthy). **(06 Marks)**
   c. Explain the objectives and functions provided by SIDBI and KIADB **(06 Marks)**

OR

10 a. Explain the objectives and functions provided by
      (i) KSFC   (ii) DIC   (iii) TECSOC   (iv) KSSIDC **(08 Marks)**
   b. Discuss the case study of Air Deccan (Captain G. R. Gopinath). **(06 Marks)**
   c. Explain Trademark, Copy Rights and Patents. **(06 Marks)**

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Fifth Semester B.E. Degree Examination, June/July 2024
Computer Networks and Security

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. Differentiate between non-persistent and persistent connections in HTTP. (05 Marks)
   b. Explain the conditional GET operation. (05 Marks)
   c. Illustrate file distribution time in peer to peer and client server architecture. (10 Marks)

OR

2 a. Explain mail transfer from sender to receiver using SMTP protocol. (10 Marks)
   b. Explain DNS Records and Messages in detail. (10 Marks)

Module-2

3 a. With a neat diagram, explain TCP segment structure. (07 Marks)
   b. Explain the causes and costs of congestion. (08 Marks)
   c. Elaborate the three way handshake in TCP. (05 Marks)

OR

4 a. Explain network assisted congestion control in ATM Available Bit Rate (ABR). (06 Marks)
   b. Explain reliable data transfer in a channel with bit errors. (06 Marks)
   c. In detail explain the selective repeat protocol for reliable data transfer. (08 Marks)

Module-3

5 a. What is routing? With a neat diagram, explain the structure of a router. (10 Marks)
   b. Explain link state routing algorithm. Compute the shortest path for the network shown in Fig.Q5(b) using link state algorithm.
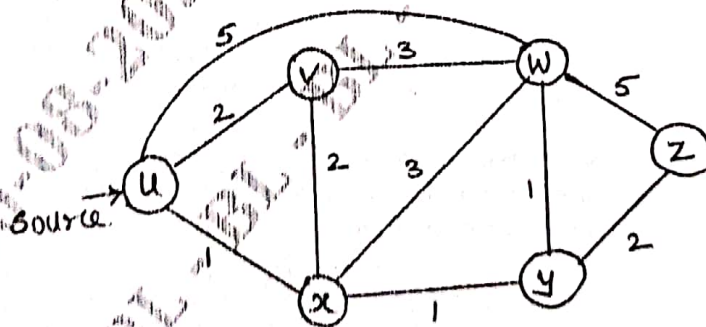

Fig.Q5(b)

(10 Marks)

OR

6 a. Explain IPv6 packet format in detail. (07 Marks)
   b. Explain the significance of spanning tree in broadcast routing. (05 Marks)
   c. Explain inter-AS routing in the internet with BGP protocol. (08 Marks)

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Module-4

7 a. Explain the threats to network security. (08 Marks)

   b. Explain RSA algorithm. Using RSA encrypt a message m = 9. Assume p = 3, q = 11 and x = 3. Compute y and show encryption and decryption. (08 Marks)

   c. Explain encryption in advanced encryption standard. (04 Marks)

OR

8 a. In the Diffie Hellman key exchange protocol, prove that the two keys K_1 and K_2 are equal. (05 Marks)

   b. With a neat diagram, discuss the steps in DES algorithm. (10 Marks)

   c. Write a note on firewalls. (05 Marks)

Module-5

9 a. Explain multimedia streaming using HTTP. (08 Marks)

   b. What are the properties of video? (04 Marks)

   c. Discuss loss anticipation schemes used by VOIP applications. (08 Marks)

OR

10 a. Briefly discuss how DNS redirects a user request to a CDN server with an example. (08 Marks)

   b. Explain setting up a call to a known IP address in SIP. (08 Marks)

   c. Explain RTP packet header. (04 Marks)

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Fifth Semester B.E. Degree Examination, June/July 2024
Database Management Systems

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Discuss the main characteristics of database approach over file-processing approach.
                                                                    (10 Marks)

   b. Explain the operations of 2-Tier and 3-Tier client/server architecture of DBMS.   **(10 Marks)**

OR

2 a. What is a weak entity type? Explain the role of partial key in design of weak entity type.
                                                                    (05 Marks)

   b. Design an ER diagram for the mail order database considering the following requirements. Employee takes order for parts from customers:
      i) Employees are identified by unique employee ID, first name and last name, address, gender, zip code.
      ii) Customer is identified by a unique customer ID, first and last name, address, location, zip code.
      iii) Part is identified by a unique part number, part name, price and quantity.
      iv) Order is identified by a unique order number, date of receipt, expected ship date, actual ship date. Each order contains specified quantities of one or more parts.
      v) Each customer can place number of orders and each order is placed by one customer only.
      vi) Each employee can take any number of orders but each order belongs to only one employee.
      vii) Each part is placed by number of customers and each customer can place order for number of parts.
      Write assumptions made.   **(10 Marks)**

   c. Differentiate specialization and generalization, giving suitable examples.   **(05 Marks)**

Module-2

3 a. List and explain the different characteristics of relations.   **(08 Marks)**

   b. With an example, discuss the basic constraints that can be specified when you create a table in SQL.   **(06 Marks)**

   c. Write queries in relational algebra for the following: [Refer tables given in question 5(b)].
      i) Retrieve the number of dependents for an employee named "Ram".
      ii) Retrieve the name of managers working in location named "XYZ" who has no female dependents.
      iii) Retrieve the name of employee who works in the same department as that of "Raj".
                                                                    (06 Marks)

OR

4 a. Briefly discuss the different types of update operations on relational database. Give examples for the violation of referential integrity in each of the update operation.   **(10 Marks)**

   b. With examples, explain the steps of ER to relational mapping algorithm.   **(10 Marks)**

1 of 2

Module-3

5 a. What is a view in SQL? Explain with examples. Discuss the problems that may arise when one attempts to update a view. **(10 Marks)**

   b. Consider the following tables:
   Employee (Name, Ssn, Salary, Superssn, Dno)
   Department (Dname, Dno, Mgrssn, Mgrstartdate)
   Project (Pname, Pno, Plocation, Dno)
   Dept_Location (DNum, Dlocation)
   Works_on (Essn, Pnum, Hours)
   Dependent (Essn, Depname, Sex)
   i)   List the names of managers who have at least one dependent.
   ii) For each employee, retrieve the employee's name and name of his or her immediate supervisor.
   iii) For each project on which more than two employees work, retrieve the project number, project name and the number of employees who work on that project.
   iv) Retrieve the name of employees whose salary is greater than salary of all the employees working in either department 5 or 6. **(10 Marks)**

OR

6 a. What is a cursor in embedded SQL? Explain with examples. **(10 Marks)**
   b. With examples, explain the following:
   i)   Java Script
   ii) Style sheets. **(10 Marks)**

Module-4

7 a. List and explain the informal design guidelines for relation schema. **(10 Marks)**
   b. What are prime and non-prime attributes? Explain with examples. **(04 Marks)**
   c. Consider the relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies (FDs) $F = \{AB \to C, BD \to EF, AD \to GH, A \to I, H \to J\}$. What is the key of R? Decompose R into 2NF and 3NF relations. **(06 Marks)**

OR

8 a. Consider the two sets of FD's:
   $F = \{A \to B, B \to C, AC \to D\}$ and $G = \{A \to B, B \to C, A \to D\}$. Show that they are equivalent. **(06 Marks)**
   b. Consider a relation R(A, B, C, D) with FDS = $\{A \to BC, B \to C, A \to B, AB \to C\}$. Find the minimal cover for the set of FDs. **(06 Marks)**
   c. Write and explain the algorithm for dependency-preserving and non additive join decomposition into 3NF schemes with suitable example. **(08 Marks)**

Module-5

9 a. What is serializability? Explain serial, non serial and conflict-serializable schedules with appropriate examples. **(10 Marks)**
   b. Discuss the time stamp ordering algorithm for concurrency control. How does strict time stamp ordering differ from basic time stamp ordering? **(10 Marks)**

OR

10 a. What is a Deadlock? Consider the following sequences of actions listed in the order they are submitted to DBMS sequence S1 : R1(A), W2(B), R1(B), R3(C), W2(C), W4(B), W3(A). Draw waits for graph in case of deadlock situation. **(06 Marks)**
   b. Explain shadow paging with suitable example. **(06 Marks)**
   c. Briefly explain the recovery techniques based on deferred update and immediate update. **(08 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐ **18CS54**

Fifth Semester B.E. Degree Examination, June/July 2024
Automata Theory and Computability

Time: 3 hrs.
Max. Marks: 100

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

Module-1

1. a. Define the following terms with examples:
   i) Alphabet ii) String iii) Language iv) Power of alphabet v) Σ^* **(08 Marks)**

   b. Design DFSM for the following languages:
   i) L = {W in {a, b}* : string W end with abb }
   ii) L = {W in {0, 1}* : string W being with 01}
   iii) Set of all strings of 0's and 1's with substring 110 **(12 Marks)**

OR

2. a. i) Convert the following NDFSM to equivalent DFSM. [Refer Fig.Q2(a)]

Fig.Q2(a) **(05 Marks)**

   ii) Construct DFSM from the following ∈-NDFSM.

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

(05 Marks)

   b. Define Equivalent and Distinguishable pair of states. Construct minimum state DFSM for the following DFSM.

δ	a	B
→ 1	2	4
* 2	3	6
3	2	4
* 4	6	5
5	2	4
6	6	6

(10 Marks)

Module-2

3. a. Define Regular Expression. Design Regular Expression for the following Languages.
   i) L = {a^m b^n : (m + n) is even }
   ii) L = {a^m b^n : m ≥ 4, n ≤ 3 }
   iii) Set of all strings of 0's and 1's with atleast one occurrence of 00 **(08 Marks)**

   b. Prove that Regular Grammar define exactly Regular Language. **(06 Marks)**

   c. Convert the following Regular expressions to equivalent FSM.
   (i) $(a + b)^* ab$ (ii) $(aa)^* + (bb)^*$ **(06 Marks)**

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OR

4 a. State and prove pumping theorem for Regular Languages. (08 Marks)
   b. Show that $L = \{a^n b^n : n \geq 1\}$ is not Regular Language. (06 Marks)
   c. Define Regular Grammar. Design Regular Grammar for the following Languages:
      i) $L = \{W$ in $\{a, b\}^* : |W|$ is even $\}$
      ii) Set of all strings of a's and b's which end with ab (06 Marks)

Module-3

5 a. Design Context Free Grammar for the following languages:
      (i) Set of all strings of a's and b's with equal number of each.
      (ii) $L = \{a^i b^j c^k : k = i + j\}$
      (iii) $L = \{a^{2m} b^n : m \geq 1 \ n \geq 1\}$
      (iv) $L = \{a^n b^n c^n : n \geq 1\}$ (10 Marks)
   b. Construct (i) left Most Derivation (ii) Right Most Derivation (iii) Parse tree for the string $W = aaabab$ using the grammar.
      $S \rightarrow AbB$ $A \rightarrow aA \mid \in$ $B \rightarrow aB \mid bB \mid \in$ (10 Marks)

OR

6 a. Define PDA. Design PDA for the following language.
      $L = \{W$ in $\{a, b\}^* : n_a(W) = n_b(W)\}$
      Number of a's is same as number of b's
      Write Transition diagram of PDA and instantaneous description of PDA for the input string $W = abba$. (14 Marks)
   b. Define CNF. Convert the following grammar to CNF.
      $S \rightarrow ABa \mid a$
      $A \rightarrow aab \mid b$
      $B \rightarrow Ac \mid c$ (06 Marks)

Module-4

7 a. Define Turing Machine. Design Turing Machine for $L = \{a^n b^n : n \geq 1\}$
   b. Write transition diagram of T.M and also write sequence of ID's of T.M for the input string $W = aabb$. (14 Marks)
   c. Explain the model of Linear Bounded Automata with a diagram. (06 Marks)

OR

8 a. Explain different techniques of Turing Machine Construction. (10 Marks)
   b. Explain Multitape Turing Machine with a diagram. (06 Marks)
   c. Explain Non-Deterministic Turing Machine. (04 Marks)

Module-5

9 a. Explain Post Correspondence Problem. (07 Marks)
   b. Explain Halting problem of Turing Machine. (07 Marks)
   c. Explain Decidability and Decidable languages. (06 Marks)

OR

10 a. Explain Quantum Computers. (07 Marks)
    b. Explain Church – Turing Thesis (06 Marks)
    c. Explain Class P and Class NP (07 Marks)

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2 of 2

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18CS54

Fifth Semester B.E. Degree Examination, June/July 2024
Automata Theory and Computability

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a.   Define the following terms with examples:
         i) Alphabet   ii) String   iii) Language   iv) Power of alphabet   v) Σ^* **(08 Marks)**
    b.   Design DFSM for the following languages:
         i) L = {W in {a, b}* : string W end with abb }
         ii) L = {W in {0, 1}* : string W being with 01}
         iii) Set of all strings of 0's and 1's with substring 110   **(12 Marks)**

OR

2   a.   i)   Convert the following NDFSM to equivalent DFSM. [Refer Fig.Q2(a)]

Fig.Q2(a)   **(05 Marks)**

         ii) Construct DFSM from the following $\in$-NDFSM.

δ	$\in$	a	b	c
→p	{ q, r }	ϕ	{ q }	{ r }
q	ϕ	{ p }	{ r }	{ p, q }
*r	ϕ	ϕ	ϕ	ϕ

(05 Marks)

    b.   Define Equivalent and Distinguishable pair of states. Construct minimum state DFSM for the following DFSM.

δ	a	B
→ 1	2	4
* 2	3	6
3	2	4
* 4	6	5
5	2	4
6	6	6

(10 Marks)

Module-2

3   a.   Define Regular Expression. Design Regular Expression for the following Languages.
         i)   L = {a^m b^n : (m + n) is even }
         ii) L = {a^m b^n : m ≥ 4, n ≤ 3 }
         iii) Set of all strings of 0's and 1's with atleast one occurrence of 00   **(08 Marks)**
    b.   Prove that Regular Grammar define exactly Regular Language.   **(06 Marks)**
    c.   Convert the following Regular expressions to equivalent FSM.
         (i) $(a + b)^*$ ab   (ii) $(aa)^* + (bb)^*$ **(06 Marks)**

1 of 2

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OR

4 a. State and prove pumping theorem for Regular Languages. (08 Marks)
   b. Show that $L = \{a^n b^n : n \geq 1\}$ is not Regular Language. (06 Marks)
   c. Define Regular Grammar. Design Regular Grammar for the following Languages:
      i) $L = \{W \text{ in } \{a, b\}^* : |W| \text{ is even}\}$
      ii) Set of all strings of a's and b's which end with ab (06 Marks)

Module-3

5 a. Design Context Free Grammar for the following languages:
      (i) Set of all strings of a's and b's with equal number of each.
      (ii) $L = \{a^i b^j c^k : k = i + j\}$
      (iii) $L = \{a^{2m} b^n : m \geq 1 \ n \geq 1\}$
      (iv) $L = \{a^n b^n c^n : n \geq 1\}$ (10 Marks)
   b. Construct (i) left Most Derivation (ii) Right Most Derivation (iii) Parse tree for the string
      W = aaabab using the grammar.
      $S \rightarrow AbB \qquad A \rightarrow aA \mid \in \qquad B \rightarrow aB \mid bB \mid \in$ (10 Marks)

OR

6 a. Define PDA. Design PDA for the following language.
      $L = \{W \text{ in } \{a, b\}^* : n_a(W) = n_b(W)\}$
      Number of a's is same as number of b's
      Write Transition diagram of PDA and instantaneous description of PDA for the input string
      W = abba. (14 Marks)
   b. Define CNF. Convert the following grammar to CNF.
      $S \rightarrow ABa \mid a$
      $A \rightarrow aab \mid b$
      $B \rightarrow Ac \mid c$ (06 Marks)

Module-4

7 a. Define Turing Machine. Design Turing Machine for $L = \{a^m b^n : n \geq 1\}$
   b. Write transition diagram of T.M and also write sequence of ID's of T.M for the input string
      W = aabb. (14 Marks)
   c. Explain the model of Linear Bounded Automata with a diagram. (06 Marks)

OR

8 a. Explain different techniques of Turing Machine Construction. (10 Marks)
   b. Explain Multitape Turing Machine with a diagram. (06 Marks)
   c. Explain Non-Deterministic Turing Machine. (04 Marks)

Module-5

9 a. Explain Post Correspondence Problem. (07 Marks)
   b. Explain Halting problem of Turing Machine. (07 Marks)
   c. Explain Decidability and Decidable languages. (06 Marks)

OR

10 a. Explain Quantum Computers. (07 Marks)
   b. Explain Church – Turing Thesis (06 Marks)
   c. Explain Class P and Class NP (07 Marks)

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18CS55

Fifth Semester B.E. Degree Examination, June/July 2024
Application Development using Python

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. List the salient features of python programming language.   **(06 Marks)**
   b. Write a python program to find the area of sphere and volume of cube. Print the results. Take input from user.   **(06 Marks)**
   c. List and explain the syntax of all flow control statements with example. **(08 Marks)**

OR

2 a. What is a function? How to define a function in python? Write a program using function to find out the given number is prime or not.   **(06 Marks)**
   b. What is local and global scope of variable in python? Explain the different scenarios with an example snippet.   **(08 Marks)**
   c. What is Exception Handling? How exceptions are handled in python? Write a python program with exception handling code to solve divide-by-zero error situation. **(06 Marks)**

Module-2

3 a. What is list? Explain the concept of slicing and indexing with proper examples. **(06 Marks)**
   b. What is Tuple? How it is different from list? Write a program to count the number of occurrences of character in a string.   **(06 Marks)**
   c. What is Dictionary in Python? How it is different from list and tuples? Write a program to create, update and display the dictionary items.   **(08 Marks)**

OR

4 a. List out five useful string methods. Explain with an example code for each method. **(10 Marks)**
   b. Compare copy.copy( ) and copy.deepcopy( ) functions with suitable examples for each. **(05 Marks)**
   c. Write a python program that accepts a sentence and find the number of words, digits, characters, uppercase letters and lowercase letters.   **(05 Marks)**

Module-3

5 a. List and explain shorthand code for common character classes. Illustrate how do you define your own character class.   **(07 Marks)**
   b. Explain the usage of caret and dollor sign characters in regular expression. **(06 Marks)**
   c. Write a python program to extract phone numbers and email addresses using regex. **(07 Marks)**

OR

6 a. What are the Ray properties of a file? Explain in detail file reading/writing process with an example of python program.   **(07 Marks)**
   b. Explain briefly what are the different methods of file operations support in python shutil module.   **(07 Marks)**
   c. Write a python program to create a folder PYTHON and under the hierarchy 3 files file1, file2 and file3. Write the content in file1 as "XXX" and in file 2 as "YYY" and file 3 content should be by opening and merge of file1 and file2. Check out necessary condition before writing file3.   **(06 Marks)**

60

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Fifth Semester B.E. Degree Examination, June/July 2024
Application Development using Python

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1   a. List the salient features of python programming language.   **(06 Marks)**
    b. Write a python program to find the area of sphere and volume of cube. Print the results. Take input from user.   **(06 Marks)**
    c. List and explain the syntax of all flow control statements with example.   **(08 Marks)**

OR

2   a. What is a function? How to define a function in python? Write a program using function to find out the given number is prime or not.   **(06 Marks)**
    b. What is local and global scope of variable in python? Explain the different scenarios with an example snippet.   **(08 Marks)**
    c. What is Exception Handling? How exceptions are handled in python? Write a python program with exception handling code to solve divide-by-zero error situation.   **(06 Marks)**

Module-2

3   a. What is list? Explain the concept of slicing and indexing with proper examples. **(06 Marks)**
    b. What is Tuple? How it is different from list? Write a program to count the number of occurrences of character in a string.   **(06 Marks)**
    c. What is Dictionary in Python? How it is different from list and tuples? Write a program to create, update and display the dictionary items.   **(08 Marks)**

OR

4   a. List out five useful string methods. Explain with an example code for each method. **(10 Marks)**
    b. Compare copy.copy( ) and copy.deepcopy( ) functions with suitable examples for each. **(05 Marks)**
    c. Write a python program that accepts a sentence and find the number of words, digits, characters, uppercase letters and lowercase letters.   **(05 Marks)**

Module-3

5   a. List and explain shorthand code for common character classes. Illustrate how do you define your own character class.   **(07 Marks)**
    b. Explain the usage of caret and dollor sign characters in regular expression.   **(06 Marks)**
    c. Write a python program to extract phone numbers and email addresses using regex. **(07 Marks)**

OR

6   a. What are the Ray properties of a file? Explain in detail file reading/writing process with an example of python program.   **(07 Marks)**
    b. Explain briefly what are the different methods of file operations support in python shutil module.   **(07 Marks)**
    c. Write a python program to create a folder PYTHON and under the hierarchy 3 files file1, file2 and file3. Write the content in file1 as "XXX" and in file 2 as "YYY" and file 3 content should be by opening and merge of file1 and file2. Check out necessary condition before writing file3.   **(06 Marks)**

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Module-4

7   a.   Define classes and objects in python. Create a class called employee and initialize it with employee id and name. Design methods to:
   i)   SetAge -- to assign age to employee.
   ii)   SetSalary -- to assign salary to the employee.
   iii)   Display -- to display all information of the employee.   **(08 Marks)**
   b.   Illustrate the concept of modifier with python code.   **(05 Marks)**
   c.   Explain __init__ and __str__ method with an example python program.   **(07 Marks)**

OR

8   a.   Define Polymorphism. Demonstrate polymorphism with function to find histogram to count the number of times each letter appears in a word and in a sentence.   **(07 Marks)**
   b.   Illustrate the concept of pure function with python code.   **(06 Marks)**
   c.   Define class diagram. Discuss the need for representing class relationships using class diagram with suitable example.   **(07 Marks)**

Module-5

9   a.   How do we download a file and save it to hard drive using request module?   **(06 Marks)**
   b.   Write a python program to give search keyword from command line arguments and open the browser tab for each result page.   **(06 Marks)**
   c.   Explain Selenium's web drive methods for finding elements.   **(08 Marks)**

OR

10   a.   Write a program that takes a number N from command line and creates an N × 100 multiplication table in excel spread sheet.   **(08 Marks)**
   b.   Write short notes on:
   Creating, copying and rotating pages with respect to pdf.   **(06 Marks)**
   c.   Write a program that find all CSV files in the current working directory, read in the full contents of each file, write out the contents, skipping the first line, to a new CSV file.   **(06 Marks)**

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18CS56

Fifth Semester B.E. Degree Examination, June/July 2024
Unix Programming

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. Explain with a neat diagram a architecture of UNIX OS. (08 Marks)
   b. List and explain the salient features of UNIX OS. (07 Marks)
   c. What are internal and external commands in UNIX? Explain with an example each. (05 Marks)

OR

2 a. Briefly explain different types of files supported in UNIX. (05 Marks)
   b. Illustrate with a diagram, the typical UNIX file system. (05 Marks)
   c. Explain Absolute and Relative pathnames with an example. (05 Marks)
   d. Explain the following commands with the help of example :
      i) cat   ii) mv   iii) cp   iv) wc   v) pwd. (05 Marks)

Module-2

3 a. Define File Permission. Describe different ways of changing file permission. (05 Marks)
   b. Which command is used for listing file attributes? Explain the significance of each field in the output. (07 Marks)
   c. File current permissions are rw_ _ w _ r _ _. Write chmod expression required to change them to relative and absolute mode for following.
      i)   r _ _ r _ _ _ _ x   ii) rwx rwx _ _ x
      iii) r _ xr _ xr _ x   iv) rw _ _ w _ _ w _ (08 Marks)

OR

4 a. Explain three standard files with respect to UNIX OS. (06 Marks)
   b. With the help of an example, explain grep command with all the options (any five options). (08 Marks)
   c. Write a shell script to : i) display list of files   ii) Process of user
      iii) Today's date   iv) Users of the system   v) Content of a file. (06 Marks)

Module-3

5 a. Explain the following API's along with their prototype :
      i) Open   ii) fcntl   iii) lseek. (12 Marks)
   b. Define the following :
      i) Read lock   ii) Write lock   iii) Mandatory lock   iv) Advisory lock. (04 Marks)
   c. Explain getrlimit and setrlimit functions with prototype. (04 Marks)

OR

6 a. With a neat diagram, explain how a C program is started and terminated in various ways. Demonstrate the use of atexit function with a sample program. (10 Marks)
   b. With a neat sketch, explain memory layout of a C program. (05 Marks)
   c. Write a C/C++ program to display :
      i) Command line arguments   ii) Environment variables. (05 Marks)

Module-4

7 a. What are Interpreter files? Give the difference between interpreter files and interpreter. (06 Marks)

b. What are Pipes? What are its limitations? Explain how pipes are created and used in IPC, also write a program to send data from parent to child over a pipe. (12 Marks)

c. What is Inter – Process Communication? List any 4 mechanisms of IPC. (02 Marks)

OR

8 a. With a neat block diagram, explain how FIFO can be used to implement client server communication model. (08 Marks)

b. Briefly explain with example :
   i) message queue   ii) semaphores. (08 Marks)

c. What are Stream pipes? What are the different ways to view stream pipes? (04 Marks)

Module-5

9 a. What are Signals? Mention different sources of signals. Write a program to setup signal handlers for SIGINIT and SIGALRM. (10 Marks)

b. What are Daemon process? Explain the characteristics and coding rules of a daemon process. (10 Marks)

OR

10 a. Explain Kill ( ) API and alarm ( ) API. (06 Marks)

b. Write a C/C++ program to illustrate the use of 'Sigaction'. (06 Marks)

c. Explain the sig.setjmp and sig.longjmp function with an example. (08 Marks)

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Fifth Semester B.E. Degree Examination, June/July 2024
Mathematic for Machine Learning

Time: 3 hrs. Max. Marks: 100

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

Module-1

1   a.   Find all solutions of the inhomogeneous system of linear equations $Ax = b$ where

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 0 \\ -1 & 2 \end{bmatrix} \quad b = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}.$$ **(07 Marks)**

   b.   Find the image and kernel of a linear. Mapping

$$\phi : R^4 \to R^2, \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} \mapsto \begin{bmatrix} 1 & 2 & -1 & 0 \\ 1 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}$$ **(07 Marks)**

   c.   Consider R^3 with $<\cdot, \cdot>$ defined for all $x, y \in R^3$ as $<x, y> = x^T A y$, $A = \begin{bmatrix} 4 & 2 & 1 \\ 0 & 4 & -1 \\ 1 & -1 & 5 \end{bmatrix}$

gs $<\cdot, \cdot>$ an inner product?   **(06 Marks)**

OR

2   a.   Find all solutions of system of equations :
$$-2x_1 + 4x_2 - 2x_3 - x_4 + 4x_5 = -3$$
$$4x_1 - 8x_2 + 3x_3 - 3x_4 + x_5 = 2$$
$$x_1 - 2x_2 + x_3 - x_4 + x_5 = 0$$
$$x_1 - 2x_2 - 3x_4 + 4x_5 = a.$$ **(07 Marks)**

   b.   Show that the vectors $\alpha_1 = (1, 0, -1)$ $\alpha_2 = (1, 2, 1)$, $\alpha_3 = (0, -3, 2)$ form a basis for R^3. Express each of the standard basis vector Q linear combination of $\alpha_1, \alpha_2, \alpha_3$.   **(07 Marks)**

   c.   Define an inner product space. For any vector α. β in an inner product space V prove that $\|\alpha + \beta\| \le \| \alpha \| + \|\beta\|$.   **(06 Marks)**

Module-2

3   a.   For a subspace $U = \text{span}\left\{ \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix} \right\} \le R^3$ and $x = \begin{bmatrix} 6 \\ 0 \\ 0 \end{bmatrix} \in R^3$ find the coordinates λ of x in

terms of the subspace U, the projection point $\pi_U(x)$ and the projection matrix P_π.   **(10 Marks)**

   b.   Diagonalize the matrix $A = \begin{bmatrix} 4 & 0 & -2 \\ 1 & 3 & -2 \\ 1 & 2 & -1 \end{bmatrix}$.   **(10 Marks)**

65

OR

4 a. Apply gram Schmidt orthogonalization process to the basis B = (1, 1, 1), (−1, 0, 1), (−1, 2, 3)} of the inner product space R^3 to find an orthogonal basis of R^3. Also find orthogonal basis of R^3. **(10 Marks)**

b. Find singular value decomposition of $A = \begin{bmatrix} 1 & -1 \\ -2 & 2 \\ 2 & -2 \end{bmatrix}$. **(10 Marks)**

Module-3

5 a. Compute the partial derivative $\frac{\partial f}{\partial A}$ for the function f = Ax where $A \in R^{3\times2}$ and $x \in R^2$. **(07 Marks)**

b. Consider $f(x_1, x_2) = x_1^2 + 2x_2^2$ where $x_1 = \sin t$ and $x_2 = \cos t$. find derivative of f with respect to t. **(06 Marks)**

c. Obtain the gradient $\frac{df}{dx}$ for the function f(x) = Ax, $f(x) \in R^M$, $A \in R^{MXN}$, $x \in R^N$. **(07 Marks)**

OR

6 a. Consider the linear model $y = \phi.\theta$ wher $\theta \in R^D$ is a parameter vector, $\phi \in R^{NXD}$ are input features and $y \in R^N$ are corresponding observation we define least squares loss function :

$L(e) : \|e\|^2$, $e(\theta)$; $y - \phi\theta$. Find $\frac{\partial L}{\partial \theta}$. **(06 Marks)**

b. For the function $f(x) = \sqrt{x^2 + \exp(x^2) + \cos(x^2 + \exp(x^2))}$ find $\frac{\partial f}{\partial x}$. **(07 Marks)**

c. Consider the matrix $R \in R^{MXN}$ and $f : R^{MXN} \to R^{NXN}$ with $f(R) = R^T R = K \in R^{NXN}$ find gradient dK/dR. **(07 Marks)**

Module-4

7 a. The probability that the noise level of a wide band amplifier will exceed 2dB is 0.05. Find the probabilities that among 12 such amplifiers the noise level of :
i) One will exceed 2dB
ii) Atmost 2 will exceed 2dB
iii) Two or more will exceed 2dB. **(06 Marks)**

b. Let X_1 and X_2 have the joint probability distribution :

X_2 ＼ X_1	0	1	2
0	0.1	0.4	0.1
1	0.2	0.2	0

i) Find marginal distribution of x_1 and x_2
ii) Find $P(x_1 + x_2 > 1)$
iii) Find conditional probability distribution of x_1 given $x_2 = 1$. And x_1 and x_2 are Independent. **(07 Marks)**

c. If x is a Poisson variate such that P(x = 2) = 9P(x = 4) + 90 P (X = 6). Find mean of x. **(07 Marks)**

2 of 3

OR

8 a. The probabilities of X, Y, Z becoming manager are 4/9, 2/9 and 1/3 respectively. The probabilities that the bonus scheme will be introduced if X, Y, Z become managers are 3/10, 1/2, 4/5 respectively. **(06 Marks)**
   i) What is the probability that bonus will be introduced
   ii) If the bonus scheme is introduced, what is the probability that manger appointed is X?

   b. Verify that the function P(x) defined by

$$P(x) = \begin{cases} e^{-x} & \text{for } x \geq 0 \\ 0 & \text{for } x < 0 \end{cases}$$

is a probability density function. Find the probability that variable x having this density falls in the interval (1.5 , 2.5). Also evaluate cumulative distribution function F(2.5). **(07 Marks)**

   c. Let n random variables $X_1, X_2, \ldots, X_n$ be independent and each have the same distribution with mean μ and variance σ^2. Use the properties of expectation to show that the sample mean $\overline{X}$ has i) mean $\mu_{\overline{x}} = E(\overline{X}) = \mu$ ii) Variance $\sigma_{\overline{x}}^2 = \text{Var}(\overline{X}) = \dfrac{\sigma^2}{n}$. **(07 Marks)**

Module-5

9 a. Using Lagrange's multiplier method, find the stationary value of the function $f(x, y, z) = x^2 y^2 z^2$ subject to the conditions $x^2 + y^2 + z^2 = a^2$. **(07 Marks)**

   b. Check whether the function $f(x) = x \log_2^x$ is convex or not. **(07 Marks)**

   c. Derive the dual linear program using Lagrange duality for the linear program $\min\limits_{x \in R^d} C^T x$, subject to $Ax \leq b$, where $A \in R^{m \times d}$, $b \in R^m$ and $C \in R^d$. **(06 Marks)**

OR

10 a. Find local minimum using gradient descent for the function $f(x) = x_1^2 - 2 x_1 x_2 + 2x_2^2 + 2x_1$. **(07 Marks)**

   b. Given $x + y + z = a$, find the maximum value of $x^m y^n z^p$. **(07 Marks)**

   c. If f_1 and f_2 are two convex functions then show that $\alpha f_1(x) + \beta f_2(x)$ is also a convex function. **(06 Marks)**

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