

(Please write your Exam Roll No.)

Exam Roll No. 08817711623

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2024

Paper Code: AIDS/ AIML/IOT-201

Subject: Data Structures

Time: 3 Hours

Maximum Marks: 60

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit. Assume missing data, if any.

Q1 Attempt any ten parts:- (2x10=20)

- What is the difference between a File Structure and a Data Structure?
- Let P be a singly linked list and let Q be the pointer to an intermediate node x in the list. What is the worst-case time complexity of the best-known algorithm to delete node x from the list?
 - $O(n)$
 - $O(\log 2n)$
 - $O(\log n)$
 - $O(1)$
- The values of Modes of a binary search tree are 1, 2, 3, 4, 5, 6, 7 and 8. Find out the preorder traversal sequence of this binary search tree?
- What is the difference between a path and a Euler path?
- What is difference between binary tree and binary search tree? Write the code to write a node of a binary search node having a data part and references to its left and right child nodes.
- Following is the algorithm for sorting table which is an array of n elements. The swap function swaps the values of the given array elements. First identify which sorting technique the algorithm XXX sort(table) is using and then convert this algorithm to programming code.

Start XXXSort(table)

```
for all elements of table
  if table[i] > table[i+1]
    swap(table[i], table[i+1])
  end if
end for
```

return table

end XXXSort

- For 1-D array if base address is 1000, find 5th element address if a data stored in this array needs only 2 bytes.
- What is difference between binary tree and binary search tree? Write the code to write a node of a binary search node having a data part and references to its left and right child nodes.
- What is the difference between hashing and indexing?
- Draw a complete binary tree and give its one application.
- The following algorithm ADD has three variables X, Y, Z and one constant. Find its space complexity and time complexity.

Algorithm: ADD (X, Y)

Step 1 - Start

Step 2 - $Z \leftarrow X + Y + 5$

Step 3 - Stop

- What is a 2-3 tree used for?

P.T.O.

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UNIT-I

- Q2 (a) What is stack? How is it different from queue? How to reverse a String using Stack? Write and explain a pseudocode to find the sum of two linked lists using Stack? (5)
- (b) Explain Infix Expression, Postfix Expression and Prefix Expression. Convert the infix expression $(A + B) * (C - D)$ into postfix expression using Stack data Structure. Is there any other method to do the same operation. (5)
- Q3 (a) Given below are the two programs, each of which is used to check whether a number is Prime or not? Find the time complexity in both. Which is faster? Explain what is time complexity and why is it important? Is time complexity same as algorithmic complexity? (5)
- (i)
- ```
function isPrime(n) {
 for (let i = 2; i < n; ++i) {
 if (n % i === 0) {
 return false;
 }
 }
 return true;
}
```
- (ii)
- ```
function isPrime(n) {
    for (let i = 2; i <= Math.sqrt(n); ++i) {
        if (n % i === 0) {
            return false;
        }
    }
    return true;
}
```
- (b) Explain the differences between the following data structures along with one real - life application of each: Stack, Array, Linked List, Queues, Trees, Graphs, dictionary and Files. (5)

UNIT-II

- Q4 (a) Write down the characteristics of a circular linked list. Where is it used? In a circular queue, write down the condition/conditions to check overflow and underflow. Write an algorithm to delete the last node from circular linked list. (5)
- (b) Write a C program to implement binary search on given data: 5, 11, 25, 35, 39, 45, 55, 66, 75, 86, 88, 99 for the item 39. Discuss the complexity of binary search. Are there some conditions under which sequential search of a list is preferred over binary search? If yes, explain it with the help of an example. (5)
- Q5 (a) (i) What is meant by Sorting and Searching? (5)
- (ii) What is the purpose of Quick sort and its advantage?
- (iii) Compare Quick sort with Insertion sort
- (b) Write a C function for the following:- (5)
- (i) that finds the total number of nodes in a linked list.
- (ii) to insert a node p after a given node q in the linked list.

UNIT-III

- Q6 (a) Given a binary tree, what are the various ways to traverse the tree. Write if these are iterative or recursive methods? (5)
- The postorder traversal of a binary tree is 8,9,6,7,4,5,2,3,1. The inorder traversal of the same tree is 8,6,9,4,7,2,5,1,3. The height of a tree is the length of the longest path from the root to any leaf. Find the height of the binary tree. (5)

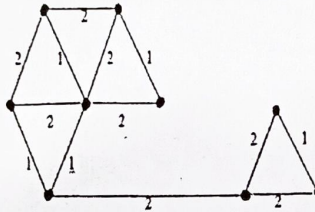
P.T.O.

(b) 'An AVL tree is also a binary search tree'. Is this statement true or false Justify your statement. Give a scenario where AVL can be used. (5)

- Q7 (a) What is the difference between an AVL tree and a B-Tree. Construct a B-Tree of Order 3 by inserting numbers from 1 to 10. (5)
- (b) Write an algorithm to compute the binary tree's height. The height or depth of a binary tree is the total number of edges or nodes on the longest path from the root node to the leaf node. The program should consider the total number of nodes in the longest path. For example, an empty tree's height is 0, and the tree's height with only one node is 1. (5)

UNIT-IV

- Q8 (a) You are running a book store and you are required to maintain a master file namely, inventory_of_books. Create records composed of structures representing all books currently in stock in your book store. Each record must contain a title, author, publisher, price, and current_stock field. (5)
- (b) What is a spanning tree. What is the minimum spanning tree. Write down its one application. Find out the number of distinct minimum spanning trees for the weighted graph below. (5)



- Q9 (a) What are Graphs and Multigraphs? Define the following terminologies associated with the graphs: (7.5)
- (i) Edge
 - (ii) Vertex
 - (iii) In-degree
 - (iv) Path
 - (v) Cycle
 - (vi) Degree
 - (vii) Directed Acyclic Graph
 - (viii) Forest
 - (ix) Complete Graph
 - (x) Weighted Graphs
- (b) What is a File? What is the importance of file organization? Explain three types of methods that can be used for organizing a file. (5)

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER-2024

Paper Code: AIDS/AIML/IOT-203

Subject: Foundations of Data Science

Time: 3 Hours

Maximum Marks: 60

Note: Attempt five questions in all including Q. no.1 which is compulsory.
Select one question from each unit. Scientific calculator is allowed.

Q1 Attempt the following questions:

(4x5=20)

- Write a Python program to generate the Fibonacci sequence up to the 10th term.
- Explain the concept of feature engineering in the context of supervised learning. How does it impact the performance of machine learning models?
- Discuss real-world applications of data science across diverse industries. Provide examples illustrating the impact of data science in solving specific problems.
- How do processing and analysis techniques vary when dealing with structured and unstructured data in the context of data science? Provide insights into the differences and their implications.
- Compare and contrast quantitative and qualitative analysis methods, elucidating the key characteristics, data types, and applications of each approach in a short note.

UNIT-I

- Q2 a) Analyse a real-world case study where insufficient data understanding led to challenges in the data science work flow and propose solutions for handling such issues. (6)
- b) Create a hypothetical scenario where the integration of advanced technologies is essential for the successful implementation of data science solutions in a specific industry (4)

OR

- Q3 a) Create a comprehensive case study showcasing the end-to-end implementation of data science applications in a sector, emphasizing the positive outcomes and lessons learned. (4)
- b) Analyse the impact of a data scientist taking on different roles on the overall efficiency and innovation within an organization. (6)

UNIT-II

- Q4 a) Develop a comprehensive framework for ethical decision-making regarding the creation and use of synthetic datasets, with a specific focus on credit card data. Address potential challenges related to privacy, security, and responsible data analysis practices. Provide detailed recommendations for ensuring ethical considerations are prioritized throughout the synthetic dataset creation process, emphasizing transparency and fairness in the analysis of credit card data. (7)
- b) Explain, using examples, how data cleaning, data imputation, and data pre-processing collectively contribute to enhancing the quality as well as the usability of datasets in a real-time data science project. (3)

OR

- Q5 a) Evaluate the significance of using the bitwise left-shift and bitwise right-shift operators in numerical operations. Apply your understanding using the numbers 20 and -20. Demonstrate the results of left shifting these numbers by 2 positions and right shifting by 2 positions, showcasing the binary representations at each step. (4)
- b) Generate a Python code that allows for customizable handling of missing values, considering different replacement strategies or drop criteria based on user preferences. Include comments explaining the code logic. (6)

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UNIT-III

- Q6 a) Explain how NumPy arrays offer advantages over Python lists. Create a 3*4 array named A and perform the following tasks: (3)
- (i) Print the last row
 - (ii) Find the transpose
 - (iii) Access the first column
- b) Analyse a case study where the data pre-processing cycle played a crucial role in enhancing the quality and usability of the dataset for a specific analysis task. (4)
- c) How would you choose between Matplotlib and seaborn when visualizing a specific type of dataset, considering their distinct features and capabilities? (3)

OR

- Q7 a) Create a basic outline for a data visualization that effectively communicates a complex dataset. Analyse the limitations of basic visualization tools for complex datasets, discussing scenarios where more advanced tools might be necessary. (3)
- b) You have a dataset named "sales_data.csv" with the following columns: "Product_ID", "Quantity_Sold", and "Unit_Price". The objective is to analyze the sales data using the pandas library in Python. Load the dataset into a Pandas Data Frame. Create a new Pandas Series named "total_sales" that represents the total sales for each product by multiplying the "Quantity_Sold" and "Unit_Price" columns. Calculate these statistical measures for the "total_sales" Series: Mean, Median and Standard Deviation. Write a Python code using the Pandas library to achieve the tasks mentioned above. (7)

UNIT-IV

- Q8 a) Compose an informative short note on unsupervised learning, covering its fundamental principles, key objectives, and common techniques. How is unsupervised learning useful for discovering hidden patterns and grouping similar data points? Mention the significance of unsupervised learning in various domains and its role in extracting valuable insights from unlabelled data. (6)
- b) Evaluate the intersection of recommendation systems and data science, explaining the fundamental principles behind recommendation systems, and elucidating how they leverage data science techniques to provide personalized suggestions to users. Emphasize the impact of recommendation systems on enhancing user experiences and driving business success in diverse industries. (4)

OR

- Q9 a) Provide a detailed comparison between collaborative filtering and content-based filtering in terms of data requirements and personalization. Also, highlight the scenarios or use cases where one approach might be more suitable than the other. (7)
- b) Illustrate the step-by-step process of implementing the chosen predictive modelling algorithm using Python, including data splitting, model training, and evaluation. (4)

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THIRD SEMESTER [B.TECH] DECEMBER-2024 JANUARY 2025

Paper Code: AIDS/AIML/IOT-205

Subject: Digital Logic Design

TIME: 3 HOURS

MAXIMUM MARKS: 60

Note: Attempt five questions in all including Q.No.1 which is compulsory.
Select one question from each unit. Assume missing data if any.

- Q1. Attempt all questions: (4x5=20)
- (a) Define Combinational Logic and give examples.
 - (b) Define Priority Encoder.
 - (c) What is State diagram?
 - (d) Differentiate Asynchronous counters and Synchronous counters.
 - (e) Prime Implicant and Essential Prime Implicant

UNIT-I

- Q2. (a) (1.5x4=6)
- i. Convert $(367.52)_8$ to binary.
 - ii. Convert $(3A.2F)_{16}$ to decimal
 - iii. Convert $(1101)_{\text{gray}}$ to binary.
 - iv. Subtract $(15)_{10}$ from $(16)_{10}$ using 2's Complement method
- (b) Explain universal NOR gate. (2)
- (c) Discuss Error - Detection codes. (2)

- Q3. (a) Solve (i) $AB+A'C+BC$ (3)
- (ii) $(A+B)(A'+C)(B+C)$ using Consensus Theorem (3)
- (b) Demorganize $[(A+B')(C+D)']$ (3)
- (c) Reduce the expression $F = [A+B[(AC+B+C')D]]$ using Boolean algebra. (4)

UNIT-II

- Q4. (a) Obtain minimal SOP expression for $F(A,B,C,D) = \sum m(0,1,2,3,5,7,8,9,11,14)$ using K map and Implement using NAND gates. (7)
- (b) Convert into Standard POS Form $Y = (A+B)(A+C)(B+C')$ (3)
- Q5. (a) Realize $Y = (A+BC)(B+C'A)$ using NAND and NOR . Design the circuit using simplified expression. (7)
- (b) Explain the characteristics of digital logic families (3)

UNIT-III

- Q6. (a) Design Full Subtractor using two Half Subtractor. (5)
- (b) Implement the following Boolean Function using 8:1 MUX. (5)
- $F(A,B,C,D) = \sum m(0,1,2,4,6,9,12,14)$
- Q7. (a) Explain Static RAM and Dynamic RAM. (5)
- (b) Design a full adder with decoder. (5)

UNIT-III

- Q8 (a) Design 3 bit Synchronous Counters with J.K Flip Flop. (5)
- (b) What is race around condition . How it is eliminated by Master Slave J-K Flip-Flop. (5)

P.T.O.

P-1/2

- Q9. (a) Implement the following function using PLA (5)
F1 (x,y,z) = $\Sigma m (1,2,4,6)$
F2 (x,y,z) = $\Sigma m (0,1,6,7)$
F3 (x,y,z) = $\Sigma m (2,6,7)$
- (b) Explain Parallel in Serial out shift Register. (5)

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2024

Paper Code: AIDS/AIML/IOT-207

Subject: Principles of Artificial Intelligence

Time: 3 Hours

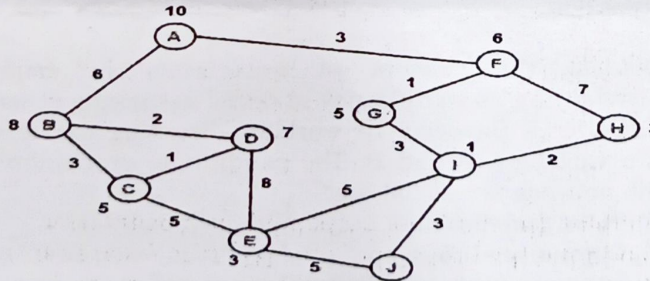
Maximum Marks: 60

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit. Assume any missing data, if any.

- Q1 Attempt all questions:- (2x10=20)
- (a) Define Search, search space and search tree.
 - (b) What is well defined problem. How it is described?
 - (c) How Artificial intelligence is useful in solving real world problems. Explain with example.
 - (d) Discuss basic elements of FOPL.
 - (e) Explain backward reasoning with example.
 - (f) What is planning and briefly explain its components.
 - (g) How learning helps in solving real time artificial intelligence problems.
 - (h) Draw the architecture of Neural network and explain basic components.
 - (i) What are predicates and facts.
 - (j) Differentiate between inductive and deductive reasoning.

UNIT-I

- Q2 (a) Why A* algorithm is known as optimal algorithm. Write A* algorithm. (3)
- (b) Consider the following graph:- (7)



The numbers written on edges represent the distance between the nodes. The numbers written on nodes represent the heuristic value. Find the most cost-effective path to reach from start state A to final state J using A* Algorithm.

- Q3 (a) Solve the following using Cryptarithmic problem: (7)

$$\begin{array}{r}
 \text{BROWN} \\
 + \text{YELLOW} \\
 \hline
 \text{PURPLE}
 \end{array}$$

- (b) Why Hill climbing is known as discrete optimization problem. What are the limitations and solutions of Hill climbing. (3)

P.T.O.

UNIT-II

- Q4 (a) Differentiate between FOPL and propositional logic. (3)
 (b) Show that $A = (P \rightarrow (Q \rightarrow R)) \rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R))$ is a tautology. (3)
 (c) Check the validity of following argument: (4)
 If races are fixed or the cosmos are crooked then the tourist trade will decline. If tourist trade decreases, then police will be happy. The police force is never happy. Therefore, races are not fixed.
- Q5 (a) John likes all kind of food.
 (b) Apple and vegetable are food.
 (c) Anything anyone eats and not killed is food.
 (d) Anil eats peanuts and still alive.
 (e) Harry eats everything that Anil eats.

Prove by resolution that John likes peanuts. (10)

UNIT-III

- Q6 (a) Dempster Shafer theory is an evidence theory. Prove the statement. Explain characteristics, advantages and disadvantages of Theory. (5)
 (b) Consider a situation in which three pieces of evidence, denoted as E1, E2, and E3, are related to a hypothesis H. The belief mass functions for each evidence are as follows: (5)
- $Bel(E1) = 0.4$
 - $Bel(E2) = 0.6$
 - $Bel(E3) = 0.7$

Now, calculate the combined belief $Bel(H)$ using Dempster's rule of combination.

- Q7 (a) Discuss the concept of uncertainty in artificial intelligence, highlighting its significance in decision-making processes. (3)
 (b) Consider a Bayesian network representing the relationship between two variables, A and B. The conditional probability tables (CPTs) for the network are as follows: (7)
- $P(A=True) = 0.6$
 - $P(A=False) = 0.4$
- Conditional Probabilities for B given A:
 $P(B=True|A=True) = 0.8$
 $P(B=False|A=True) = 0.2$
 $P(B=True|A=False) = 0.3$
 $P(B=False|A=False) = 0.7$

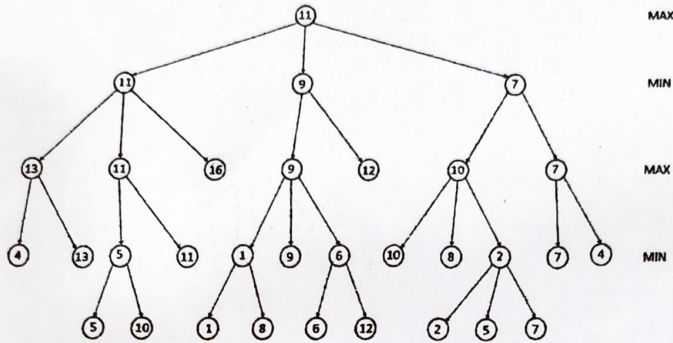
Given this Bayesian network:

1. Calculate the probability that both A and B are true.
2. Determine the probability that B is true given that A is false.
3. Compute the marginal probability of B being true.

P.T.O.

UNIT-IV

Q8 (a) Use the Minimax algorithm to compute the minimax value at each node for the game tree below. (7)



(b) Explain modified minimax algorithm. (3)

Q9 Write short notes on:- (3+3+4=10)

- (a) Expert Systems working
- (b) Game development using AI
- (c) Dendral Expert system

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END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2024-JANUARY 2025

Paper Code: AIDS-209
AIML-209
IOT-209

Subject: Probability, Statistics and Linear Algebra

Time: 3 Hours

Maximum Marks: 60

Note: Attempt five questions in all including Q. No.1 which is compulsory. Select one question from each unit.

- Q1 Attempt the following questions:- (Any Five) (5x4=20)
- (a) If X and Y are discrete random variables and K is a constant then prove: $E(X+K)=E(X)+K$ and $E(X+Y)=E(X)+E(Y)$.
 - (b) State reason to justify whether the following statement is true or false. "The mean of a Binomial distribution is 6 and standard deviation is 3".
 - (c) What do you understand by Kurtosis? The first four moments about a mean of frequency distribution are 0, 100, -7 and 35000.
 - (d) What do you understand by Kurtosis? The first four moments about a mean of frequency distribution are 0, 100, -7 and 35000.
 - (e) Explain Null and Alternative Hypothesis with suitable examples? Discuss the confidence intervals in two sample problem of normal populations?
 - (f) A can hit a target 3 times in 5 shots, B can hit a target 2 times in 5 shots and C can hit a target 3 times in 4 shots. All of them fire one shot each simultaneously at the target. What is the probability that two shots hit a target?

UNIT-I

- Q2 (a) The daily consumption of milk in a city, in excess of 20,000 litres is approximately distributes as a Gamma variate with parameters $\alpha = 1/10,000$ and $\lambda = 2$. The city has a daily stock of 30,000 litres? What is the probability that the stock is insufficient on a particular day? (5)
- (b) In a bolt factory there are four machines X_1, X_2, X_3, X_4 manufacturing 20%, 15%, 25%, 40% of the total output respectively of their outputs 5%, 4%, 3% and 2% in the same order are defective bolts. A bolt is chosen randomly from the factory's production and is found to be defective. What is the probability that the bolt was manufactured by machine X_1 , or X_4 ? (5)

OR

- Q3 (a) State the multiplication rule of probability. From it derive the condition of two events to be independent. For a system composed of k components in parallel, if p_i independent of others is the probability that the i^{th} component will function $i = 1, 2, \dots, k$, then what is the probability that system will function? (5)
- (b) A discrete variate X can assume only the values $x=1, 2, 3, \dots$ with probabilities 2^{-x} . Show that Chebyshev's inequality gives $P[|X-2| \leq 2] > 1/2$, while the actual probability is $15/16$. (5)

P-1/3

P.T.O.

UNIT-II

- Q4 (a) A Sales tax officer reported that the average sales of 500 business establishment in a year is ₹36,000/- and standard deviation is ₹10,000/-. Assuming that the sales in these business are normally distributed, find: (i) the number of businesses the sales of which are more than ₹40,000/-, (ii) the percentage of businesses the sales of which are likely to range between ₹30,000 and ₹40,000? (5)
- (b) Calculate the first four moments of a distribution frequency distribution about the mean and explain the skewness and kurtosis of the following frequency distribution: (5)

X	-4	-3	-2	-1	0	1	2	3	4
f	3	4	5	7	12	7	5	4	3

OR

- Q5 (a) The Personnel manager of a large chain of retail stores is interested in studying the relationship between the experience of his sales personnel and their sales performance. For this purpose, he took a Sample of 5 sales personnel at random and recorded data regarding their experience (in years) and sales (in ₹ lakhs) as shown in the following data. Calculate Karl Pearson's coefficient of correlation between the experience and sales performance of the sales personnel. (5)

Sales Personnel	Experience (in Yrs.)	Sales Performance (₹ lakhs)
1	2	20
2	4	12
3	6	18
4	8	10
5	10	40

- (b) In a partially destroyed laboratory record of an analysis of a correlation data, the following results only are eligible: variance of $x=9$ Regression equations: $8x-10y+66=0$, $40x-18y=214$ Find: (5)
- (i) Mean values of x and y ,
- (ii) the co-efficient of correlation between x and y ,
- (iii) the standard deviation of y (σ_y)

UNIT-III

- Q6 (a) Fit a second degree parabola to following data taking $X=(X-5)$ as the independent variable and $Y=y-7$ as dependent variable: (5)

x	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	13	10	9

- (b) A group of 10 rats feed on a diet A and another group of 8 rats fed on a different diet B, recorded the following increase in weights. Does it show that superiority of diet A over that of B. (5)

Diets A (gm.)	5	6	8	1	12	4	3	9	6	10
Diets B (gm.)	2	3	6	8	10	1	2	8	-	-

1-2/3

OR

- Q7 (a) Following data is for the measurement of train resistance R (Ids/ton) with velocity (V/mph) . If $R = a + bV + cV^2$, find a, b, c ? (5)

V	20	40	60	80	100	120
R	5.5	9.1	14.9	22.8	33.3	46.0

- (b) Before an increase in excise duty on tea, 800 people out of a sample of 1000 persons were found to be tea drinkers. After an increase in the excise duty, 800 persons were known to be tea drinkers in a sample of 1200 people. Do you think that there has been a significant decrease in the consumption of tea after the increase in the excise duty? (5)

UNIT-IV

$$A = \begin{bmatrix} 1 & 1 & 1 & 0 \\ -1 & 0 & -2 & 1 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 2 & 1 \end{bmatrix}$$

- Q8 (a) Let $A = \begin{bmatrix} 1 & 1 & 1 & 0 \\ -1 & 0 & -2 & 1 \\ 1 & 1 & 1 & 0 \\ 1 & 0 & 2 & 1 \end{bmatrix}$ Find a 4×3 matrix Q satisfying $Q^t Q = I_3$ and an upper triangular matrix R such that $A = QR$, using Gram Schmidt orthogonalization. (5)
- (b) Solve the system of equations $2x + 3y - z = 1$, $4x + y - 3z = 11$ and $3x - 2y + 5z = 21$. (5)

OR

$$\begin{bmatrix} 0 & 2 & -6 & -2 & 4 \\ 0 & -1 & 3 & 3 & 2 \\ 0 & -1 & 3 & 7 & 10 \end{bmatrix}$$

- Q9 (a) Find an LU-factorization of matrix $A =$ (5)
- (b) If A is a Hermitian matrix, **then proof that:** (5)
- (i) Eigenvectors corresponding to distinct eigenvalues are orthogonal.
- (ii) A is unitarily diagonalizable?

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER 2024

Paper Code: AIDS-211

Subject: Universal Human Values-II

AIML-211

IOT-211

Time: 3 Hours

Maximum Marks: 60

Note: Attempt five questions in all including Q.No.1 which is compulsory.

Q1 Answer any four of the following:-.

(5x4 =20)

- What is Ethical Human Conduct? How does it help an individual to evolve as a professional?
- What are the basic nine Universal Human Values in relationships? How do they help in maintaining harmony in society?
- Human beings are the co-existence of 'I' and the material body - Explain.
- What is happiness? How does it help in fulfilling human aspirations?
- Holistic perception of harmony in nature - Explain

Q2. Describe the consequences of our attempt to achieve happiness and prosperity by becoming anti-ecological. (10)

Q3 Explain the role of Right Understanding, Natural Acceptance and Self Exploration in maintaining the Universal Human Order. (10)

Q4 Explain how Recyclability and Self Regulation in nature leads to holistic and harmonious co-existence at all levels. (10)

Q5 Explain the role of basic factors- Justice, Trust and Peace in the undivided society; from family to world order. (10)

Q6 Describe the purpose of Value Education and how does it help to create a better society. (10)

P-1/1

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] DECEMBER-2024

Paper Code: AIDS-213 /AIML-213/IOT-213

Subject: Critical Reasoning and System Thinking

Time: 3 Hours

Maximum Marks: 60

Note: Attempt all questions as directed. Including Q.No.1 which is compulsory. Internal choice is indicated.

- Q1 Attempt **any Five** of the following questions: (5×4=20)
- In reasoning, what does it mean to "recognize implications"? Provide a simple example.
 - What is an argument in critical reasoning? Identify the premise and conclusion in this statement:
"All humans are mortal. Socrates is human. Therefore, Socrates is mortal."
 - What is the difference between inductive and deductive arguments? Give one example of each.
 - What makes an argument valid? How does it differ from an invalid argument?
 - Why is defining the problem critical in problem-solving? Provide an example of poor problem definition and its consequences.
 - What does it mean to think out of the box? Provide one example of an unconventional solution to a problem.
 - List and explain two common barriers to critical thinking.
 - What is the significance of perception (pratyaksha) in Nyaya Darshana?
- Q2 (a) Analyze the reasoning in this statement: "If we ban smoking in public places, it will reduce overall smoking rates." Discuss its validity and assumptions. (5)
- (b) How does strategic reasoning differ from analytical reasoning? Illustrate with an example. (5)
- OR**
- Q3 (a) A recent report claims that "electric cars are the future of transportation because they reduce carbon emissions." Critically analyze this claim, discuss its implications, and conclude whether the argument is convincing. (6)
- (b) Define confirmation bias. How might it affect decision-making? (4)
- Q4 (a) Classify the following as inductive or deductive reasoning and justify your answer:
"In the last five years, the company's profits have grown by 10% annually. Therefore, we predict that profits will grow by 10% next year as well!" (5)
- (b) Analyze the following argument:
Premise 1: If it rains, the ground will be wet.
Premise 2: It is raining.
Conclusion: Therefore, the ground is wet.
Is this argument valid? Sound? Explain your reasoning. (5)

P-1/2

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OR

- Q5 (a) Consider the statement: "A car moves because the engine converts fuel into energy that powers the wheels." Explain how this statement can serve as both an explanation and an illustration. (5)
- (b) Define sound and unsound arguments. Why is validity a necessary condition for soundness? (5)

- Q6 (a) What is lateral thinking, and how does it differ from logical thinking? Mention two lateral thinking techniques. (5)
- (b) Describe the Six Thinking Hats method. How does it enhance group decision-making? (5)

OR

- Q7 (a) A team is investigating why a product failed in the market. They identify the following potential causes: (6)
- (i) Poor marketing strategy
 - (ii) Defective product features
 - (iii) High price
 - (iv) Limited availability
- Construct a basic fishbone diagram using these categories and explain its structure.
- (b) Explain the purpose of brainstorming. How does it differ from traditional idea generation? (4)

- Q8 Analyze the Abilene Paradox. How does it impact team decision-making, and what strategies can be employed to prevent it? Provide a real-life or hypothetical example. (10)

OR

- Q9 Discuss the role of tools like Gantt charts, risk matrices, and SWOT analysis in managing projects and mitigating risks. Use an example to demonstrate their application. (10)
