Time: 3 Hours **Max Marks: 80**

Instructions:
- Figures to the right indicate max marks.
- Draw appropriate diagram whenever applicable.
- Assume suitable data wherever applicable. State your assumptions clearly.
- **Question number 1 is compulsory.**
- Attempt **any Three** questions from remaining questions.

Q1 **Attempt Any Four from the following. (5 marks each)** **20**

a) What is PEAS descriptor? Give PEAS descriptor for online English tutor..
b) Write a short note on: AI Perspectives: Acting and Thinking humanly.
c) Define AI. List the applications of AI.
d) What are the different types of learning in AI?
e) Write a Prolog program to calculate the factorial of a given number.

Q2 a) Represent each of the following sentences in first-order logic. **10**

1. Every student smiles.
2. No one talks.
3. At least one student failed History.
4. Every person who buys an insurance policy is smart. 5. No person buys an expensive policy.

b) Explain how Genetic Algorithm works. Define chromosome, selection, fitness function, cross over and mutation as used in Genetic Algorithm. **10**

Q3 a) Explain Bayesian Belief network with example. **10**

b) Compare and contrast simulated annealing with Hill climbing. Explain problems faced by Hill Climbing algorithm. **10**

Q4 a) Illustrate forward chaining and backward chaining in propositional logic with example. **10**

b) Explain the different types of environments for Intelligent agents. Explain environment for tic tac toe problem. **10**

Q5 a) Explain Alpha Beta Pruning algorithm with an example. **10**

b) Explain Depth Limit search and Iterative Deepening Search Algorithm. **10**

Q6 a) Explain Learning agent and Goal based agent with diagram. **10**

b) What is planning in AI? Explain total order planning with an example. **10**

Time: 3 hours **Max. Marks: 80**

N.B. (1) Question one is Compulsory.
(2) Attempt any 3 questions out of the remaining.
(3) Assume suitable data if required.

Q. 1	a)	Explain why there is need for layered designing for networking and communication.	**05**
	b)	Explain the functionality of Sliding window protocol	**05**
	c)	Explain the different classes of IPV4 addressing technique	**05**
	d)	Write Short note on Parity check	**05**
Q 2	a)	Compare between layers of OSI model and TCP/IP model with a neat diagram	**10**
	b)	What are the different DLL design issues? Describe them in brief.	**10**
Q 3	a)	What is Channel allocation problem? Explain CSMA/CD protocol. A network with CSMA/CD has 100 Mbps bandwidth and 25.60 micro second maximum propagation delay. What is the minimum frame size?	**10**
	b)	Explain Cisco Service Oriented Network Architecture in detail	**10**
Q 4	a)	What is ALOHA? Explain Pure ALOHA and Slotted ALOHA in detail	**10**
	b)	Differentiate between Routed and Routing protocols and also depict the classification of routing algorithms.	**10**
Q 5	a)	What is SDN? Explain SDN Building Blocks with different Open flow messages.	**10**
	b)	Elaborate TCP flow control mechanism with example	**10**
Q 6		Write a short note on	
	a)	TCP Timers	**05**
	b)	DNS	**05**
	c)	Static routing and Dynamic routing	**05**
	d)	Packet Switched vs Circuit Switched Network	**05**

Time: 3 hours **Max. Marks: 80**

N.B. (1) Question one is Compulsory.
(2) Attempt any 3 questions out of the remaining.
(3) Assume suitable data if required.

Q. 1 (a) Explain data warehouse features. 05
(b) Demonstrate with diagram the process of KDD. 05
(c) What is Market basket analysis? 05
(d) Explain with example confusion matrix, accuracy and precision. 05

Q. 2 (a) (i) Explain with example Star schema and Snowflake schema. 10
(ii) Explain with example any four OLAP operations.
b) What is clustering? Explain K-mean clustering algorithm. Suppose that the data mining task is to cluster the following items into two clusters.
{4, 8, 20, 24, 6, 40, 60, 22, 50}. Apply k-means algorithm. 10

Q.3 a) i) Data preprocessing is necessary before data mining process". Justify your answer. 05
ii) Explain any 2 data normalization techniques. 05
b) i) Explain with example Support, Confidence and Lift function in association mining. 05
ii)Consider the transaction database given below:
Use Apriori Algorithm with min-support =50% and min-confidence = 60%,
to find frequent itemset and strong association rules. 05

TID	Items
100	a,c,d
200	b,c,e
300	a,b,e
400	b,e

Q. 4 a) Illustrate any one classification technique for the following dataset.
Show how we can classify new tuple **(Homeowner=YES, Status =Employed, IIncome = Average)**. 10

Sr. No	**Homeowner**	**Status**	**Income**	**Defaulted**
1	Yes	Employed	High	No
2	No	Business	Average	No
3	No	Employed	Low	No
4	Yes	Business	High	No
5	No	Unemployed	Average	Yes
6	No	Business	Low	No
7	Yes	Unemployed	High	No
8	No	Employed	Average	Yes
9	No	Business	Low	No
10	No	Employed	Average	Yes

b) What is web mining? Explain web content mining in detail 10

Q. 5 a) Explain FP tree with appropriate example. 10
b) Clearly explain the working of DBSCAN algorithm using appropriate diagram 10

Q. 6 a) Explain Multidimensional and multilevel rule mining with example. 10
b) Explain with example different data sampling techniques. 10

Duration: (3 hrs.) **[Maximum Marks : 80]**

NB:

(1) Question No. 1 is compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

Q1. ATTEMPT ANY FOUR [20]

a. What is hypothesis testing ? Explain type I and type II errors?

b. What is Fisher's exact test?

c. Explain the difference between Stratified and Cluster Sampling.

d. Explain Linear Regression and its Applications.

e. Define standard deviation and interquartile range with examples.

Q2. a. Find the correlation coefficient from the given data. [10]

Subject	Experience (X)	Salary (Y)
1	5	50
2	8	60
3	12	75
4	15	85
5	18	95
6	20	105

b. What is Chi-Square Test? A retail company wants to determine if there is a significant association between customer gender and preference for online shopping vs. in-store shopping. The company collected data from a random sample of 200 customers, and the results are summarized in the following contingency table. Use the Chi-Square Test for Independence to determine if there is a statistically significant association between gender and shopping preference at a 5% significance level (α=0.05) [10]

Gender	Prefers Online Shopping	Prefers In-Store Shopping	Total
Male	60	40	100
Female	70	30	100
Total	130	70	200

Q3. a. Explain the concept of p-value in hypothesis testing [10]

b A school conducted an aptitude test for three different grades (Grade A, Grade B, and Grade C). The scores obtained by the students in each grade are given. At a 95% confidence level, determine if the scores differ significantly across the three grades using the Kruskal-Wallis test. [10]

Grade A	Grade B	Grade C
85	78	90
88	82	85
80	75	88
92	85	92
78	80	84
85	88	80

Q4. a. A researcher is analyzing the test scores of students. The sample mean score for 20 students is 250, the expected (population) mean is 260, and the standard deviation is 40. Calculate the z-score for this sample mean. [10]

b. A researcher conducted a survey of 50 college students to determine how many hours they spend studying per week. Create a frequency distribution table for the data provided. [10]

12, 15, 8, 10, 20, 7, 13, 18, 9, 11, 14, 16, 6, 12, 15, 19, 10, 8, 13, 17, 11, 14, 9, 12, 16, 7, 15, 18, 10, 13, 16, 9, 11, 14, 8, 12, 17, 10, 15, 19, 6, 13, 18, 11, 14, 9, 12, 16, 10, 15

Q5. a. A pharmaceutical company has developed a new drug that they claim lowers blood pressure more effectively than the current standard drug. The average reduction in blood pressure for patients using the standard drug is 10 mmHg, with a standard deviation of 5 mmHg. The company conducts a clinical trial with 30 patients using the new drug and observes an average reduction of 12 mmHg. At a 0.05 significance level, answer the following: [10]

1. State the null and alternative hypotheses.
2. Calculate the test statistic.

Determine if the new drug is statistically significantly more effective than the standard drug.

b. Find the simple linear regression equation for the given data. [10]

Time	Growth
3	12
6	18
9	25
12	32
15	40
18	45

Q6. a. Explain the concept of two-way ANOVA. How does it differ from one-way ANOVA? Describe the assumptions of two-way ANOVA and how you would check these assumptions. Also, briefly explain Friedman's test as a non-parametric alternative. [10]

b. Write short notes on (any two) [10]

1. Chi-square distribution.
2. Weibull distribution.
3. Stem & Leaf Plot
4. Box Plot.

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(3 hours) **Total Marks: 80**

N.B. **1. Question No. 1 is compulsory**
2. Attempt any three questions from the remaining five questions
3. Assume suitable data if necessary and justify the assumptions
4. Figures to the right indicate full marks

Q1 Answer the following questions.

	A	What is DNS? Explain the working of DNS with its components.	05
	B	Write a JavaScript function that validates: • Username (alphanumeric, 5-15 characters) • Password (minimum 8 characters, must contain uppercase, lowercase, and number)	05
	C	Explain the concepts of Arrow Functions in JavaScript ES6 with examples.	05
	D	What is a callback in Node.js? Explain with a suitable example.	05
Q2	A	Explain Document Object Model (DOM) and its levels. Write a JavaScript program that accepts two numbers as input and displays their sum.	10
	B	What is React.js? Discuss different features and advantages of React.js. What are components in React? Give examples.	10
Q3	A	Explain different types of Node.js modules. What are the modules that provide core functionality?	10
	B	Write a stepwise process to create an APP using ReactJS to print “Hello World”.	10
Q4	A	Compare and contrast MVC, FLUX, and Redux architectures. Explain their use in modern web applications.	10
	B	Write a Node.js program using Express to create a basic server that: • Handles GET and POST requests • Implements basic routing • Includes error handling Provide complete code with explanations.	10
Q5	A	Explain the concept of React Hooks. What are the rules of using Hooks? Provide examples of useState and useEffect.	10
	B	What is ExpressJs? Explain features of ExpressJS.	10
Q6	A	Describe the architecture of Node.js with a neat diagram. Explain its event-driven programming model.	10
	B	Write JavaScript code to process an online form with the following validations: • All fields must be filled • Email must contain “@” and “.” • Age must be between 18 and 60 Include proper error messages and form submission handling.	10

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