

(3 Hours)

Total Marks: 80

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

- Q1 Solve any Four out of Five** 20
- A Describe problem formulation with Missionaries and Cannibals Problem 05
- B Convert in to FOPL 05
- EVERYONE LIKE EVERYONE
 - ALL GRADUATES ARE UNEMPLOYED
- C Write a PROLOG program for Fibonacci of given number. 05
- D Identify the PEAS descriptor for Medical Diagnosis System. 05
- E Write a short note on: AI Perspectives: Acting and Thinking humanly 05
- Q2** A Explain the Expert Systems along with its Components. Give real life example of Expert system 10
- B Explain any two Environment Types in detail. 10
- Q3** A Compare and contrast simulated annealing with Hill climbing 10
- B Illustrate forward chaining and backward chaining in propositional logic with example. 10
- Q4** A Explain different inference rule for First Order predicate logic 10
- B What do you understand by Min Max Search and alpha beta search? Explain in detail with example. 10
- Q5** A Consider the following statements. 10
- (a) Prakash likes all kind of food.
 - (b) Mango and Fish are food.
 - (c) Anything anyone eats and is not killed is food.
 - (d) Jay eats peanuts and still alive.
 - (e) Meena eats everything that Jay eats.
- Prove that Prakash likes Peanuts using Resolution.
- B Explain various methods of knowledge representation techniques. 10
- Q6** A Explain Iterative Deepening Search Algorithm based on performance measure. 10
- B Explain Prior and Posterior Probability with example. 10

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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) Demonstrate with diagram Data Mining Architecture. 05

b) What is outlier? Explain different types of outliers 05

c) What is prediction? Explain about Linear regression method. 05

d) Explain different OLAP operations on multidimensional data . 05

Q. 2 a) Briefly outline with example, how to compute dissimilarity between the objects describe following

i) Nominal attributes

ii) Asymmetric binary attributes 10

b) Calculate Accuracy, Recall and Precision with the help of following data:

True Positive (TP)= 45, True Negative (TN) = 25, False Positive (FP)= 18, False

Negative (FN)= 12. 10

Q. 3 a) Describe the various phases in knowledge discovery process with a neat diagram 10

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

Q. 4 a) What is Clustering Technique ? Discuss the Agglomerative algorithm with the following data and plot a Dendrogram using single link approach. The table below comprises sample data items indicating the distance between the elements. 10

Item	P1	P2	P3	P4	P5
P1	0				
P2	9	0			
P3	3	7	0		
P4	6	5	9	0	
P5	11	10	2	8	0

b) A database has five transactions. Let min-support = 60_ and min- confidence = 80%. Find all frequent item sets by using Apriori Algorithm T_ID is the transaction ID 10

T_ID	Items bought
T1000	M,O,N,K,E,Y
T1001	D,O,N,K,E,Y
T1002	M,A,K,E
T1003	M,U,C,K,Y
T1004	C,O,O,K,E

- Q. 5 a) Explain Decision Tree classification Approach in detail ? 10
- b) What is market basket analysis? Explain with an example. State and explain with formula the meaning of the following term;
- i) Support
 - ii) Confidence 10
- Q. 6 a) Explain BIRCH algorithm using appropriate diagram. 10
- b) Define multidimensional and multilevel association mining 10
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Duration: 3hrs

[Max Marks:80]

N.B. 1. Question No. 1 is compulsory.**2. Attempt any three questions out of remaining five.****3. All questions carry equal marks****4. Assume Suitable data, if required and state it clearly.**

- 1 Attempt any four: 20
- (a) Define Confidence Interval?
- (b) In a certain property investment company with an international presence, workers have a mean hourly wage of \$12 with a population standard deviation of \$3. Given a sample size of 30, estimate and interpret the SE of the sample mean.
- (c) What is hypothesis testing? Explain type I and type II errors?
- (d) What do you mean by correlation and regression? Explain with example.
- (e) What is analysis of variance? Explain its usage.
- 2 (a) X is a normally distributed variable with mean $\mu = 30$ and standard deviation $\sigma = 4$. Find 10
- a) $P(x < 40)$
- b) $P(x > 21)$
- c) $P(30 < x < 35)$
- (b) . Some vehicles pass through a junction on a busy road at an average rate of 300 per hour. 10
- a. Find out the probability that none passes in a given minute.
- b. What is the expected number of passing in two minutes?
- c. Find the probability that this expected number found above actually pass through in a given two-minute period.
- 3 (a) For a certain type of computers, the length of time between charges of the battery is normally distributed with a mean of 50 hours and a standard deviation of 15 hours. John owns one of these computers and wants to know the probability that the length of time will be between 50 and 70 hours. 10
- (b) The average score on a test is 80 with a standard deviation of 10. With a new teaching curriculum introduced it is believed that this score will change. On random testing, the score of 38 students, the mean was found to be 88. With a 0.05 significance level, is there any evidence to support this claim? 10
- 4 a) Explain QQ plots in detail. Show how scatterplots explores relationships between variables. 10

- b) Given four samples A, B, C, D. Solve using one-way ANOVA to identify any difference between samples. 10

Observation	A	B	C	D
1	8	12	18	13
2	10	11	12	9
3	12	9	16	12
4	8	14	6	16
5	7	4	8	15

- 5 a) What is F-Test? If the F statistic as 2.38 and the degrees of freedom obtained by him were 8 and 3. Find out the F value from the F Table and determine whether we can reject the null hypothesis at 5% level of significance (one-tailed test). 10
- b) Find the simple linear regression equation that fits the given data and coefficient of determination: 10

X	Y
2	69
9	98
5	82
5	77
3	71
7	84

- 6 a) Explain Binomial distribution in detail. 10
 Bottles of water have a label stating that the volume is 12 oz. A consumer group suspects the bottles are under-filled and plans to conduct a test. What would a Type I error in this situation mean?
- 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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Q1 ATTEMPT ANY FOUR

[A] Explain different network topologies. [05]

[B] Differentiate between TCP and UDP. [05]

[C] 4-bit data bits with binary value 1010 is to be encoded using even parity Hamming code. What is the binary value after encoding? [05]

[D] Explain IPv4 classful addressing and state its disadvantages. [05]

[E] Enlist and explain in brief different design issues in data link layer. [05]

Q2 [A] Explain OSI reference model and compare it with TCP/IP reference model. [10]

[B] Explain in brief Cisco PPDIIO network design methodology. [10]

Q3 [A] What is Channel Allocation problem? Explain CSMA/CD protocol in detail. [10]

[B] Explain IPv4 header format with a neat diagram. [10]

Q4 [A] A bit stream 10011101 is transmitted using the standard CRC method. The generator polynomial is 1001. What is the actual bit transmitted? Suppose the third bit from left is inverted during transmission, how will the receiver detect this error? [10]

[B] Elaborate the architecture of NoX and PoX controller of SDN with their comparison. [10]

Q5 [A] Explain Distance Vector Routing algorithm with an example. [10]

[B] Explain three way handshaking technique in TCP [10]

Q.6 Write a short note on:

[A] DNS [10]

[B] Sliding window protocols. [10]

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Instructions to the candidates:

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- Q1** Answer the following questions.
- A Explain how DNS works and the process it follows to resolve domain names to IP addresses. **05**
- B Differentiate between JSON and XML. Discuss their use cases and advantages in web development. **05**
- C Illustrate with an example how to handle form validation in JavaScript, including client-side validation for an email and password field. **05**
- D Create a simple React application that fetches data from an external API and displays it in a list format. Describe the steps involved. **05**
- Q2** A Discuss the asynchronous nature of JavaScript and how Promises and async/await improve handling of asynchronous operations. Provide code examples **10**
- B Explain the concept of state and props in React. How do they differ, and how are they used in components? **10**
- Q3** A Compare and contrast the use of classes and inheritance in JavaScript with functional programming paradigms. Provide examples. **10**
- B Create a simple Express application that integrates with React to display a list of items fetched from a server. Describe the steps involved and provide code snippets. **10**
- Q4** A Explain how React's useEffect hook can be used to perform side effects in functional components. Provide an example where useEffect is used to fetch data from an API and display it in a component. **10**
- B Create a web page using HTML and JavaScript where an image moves across the screen from left to right continuously. Provide the HTML and JavaScript code and explain the implementation. **10**
- Q5** A Describe the Event Loop in Node.js. How does it handle asynchronous operations? Provide an example. **10**
- B Explain how React Router can be used to create a single-page application (SPA). Provide an example of routing in React. **10**
- Q6** A Describe how to manage state in a React application using Redux. Include an example to illustrate state management in a complex application. **10**
- B Explain how Node.js handles asynchronous operations using callbacks, Promises, and async/await. Provide code examples for each method. **10**
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