Duration: 3Hours **[Max Marks:80]**

N.B. : (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.
(5) Use of Statistical Tables are allowed

Q1. Attempt any four **[20]**

a Formulate the problem for 8 queens.

b What is the difference between unification and Skolemization?

c Define over fitting and under fitting in detail with a diagram.

d Explain utility based agent architecture with diagram.

e Compare box-plot and scatter-plot.

f Explain working of Forward and Backward Chaining algorithms

Q2. a Consider following 5*5 grid where S represents start and G goal position, # represents an obstacle. .(dot) represents free to move in cell. consider agent can follow four standard moves in this puzzle world. **[10]**

S	.	.	#	.
#	.	#	.	.
.	.	.	#	.
.	#	.	.	.
.	.	.	.	G

Represent this puzzle as state space search problem. Apply Hill Climbing Search. Does the algorithm stuck in Local Minima ?

b Write note on following supervised learning techniques: a) SVM b) ID3 **[10]**

Q3. a What do you mean by data analytics? What are the different types of data analytics? **[10]**

b What is linear regression? Explain its significance in ML. Compare it with logistic regression **[10]**

Q4. a Perform t-test on following data about choice of customers who peferred either tea or coffee. The experiment was repeated 5 times and results are tabulated below. Comment weather the mean of two sets are same based on test result? (Consider α=0.05, t(0.05,3)=3.182, t(0.05,4)= 2.776, t(0.05,8)=2.306 t(0.05,9)=2.262 t(0.05,10)=2.228) **[10]**

Tea	4	5	7	6	9
Coffee	3	8	6	14	7

Clearly mention Null and Alternate hypothesis. Also comment weather t-test fails or succeeds in rejecting Null Hypothesis.

b What are the different uni-variate plots in EDA? Explain them in detail **[10]**

Q5. a What are the different issues in ML algorithms? **[10]**

b Compare Z-Test, T-Test and ANOVA in detail. **[10]**

Q6. a Describe the architecture of ML application. Explain with a diagram. **[10]**

b Describe any four uninformed search strategies. Compare them with time complexity, space complexity, optimality and completeness. **[10]**

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

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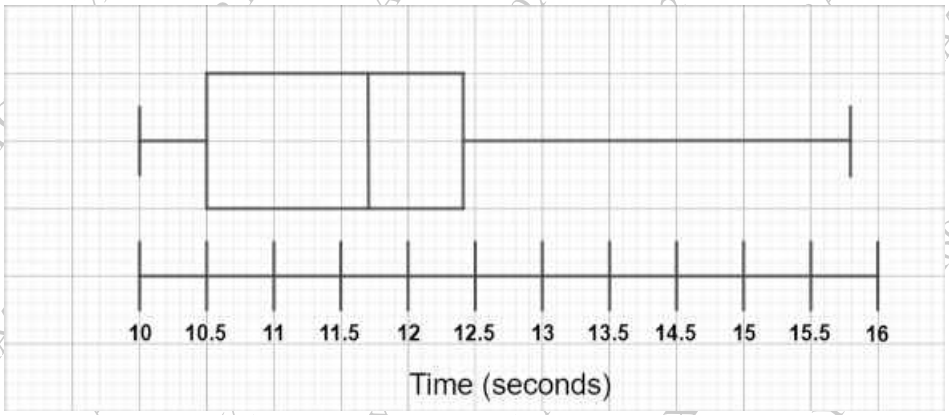
1 Attempt any four: **20**

(a) The box plot below was constructed from a collection of times taken to run a 100 m sprint. Using the box plot, determine the range and interquartile range. **5**



(b) Define Type I and Type II Errors **5**

(c) In 800 families with 4 children each. Classify according to given criteria, how many families would you expect to have? **5**
2 boys and 2 girls

(d) A coin is tossed three times. Calculate the probability of obtaining more heads than tails. **5**

(e) Explain the various decomposition models used in time series data. Also, state which decomposition model will be appropriate for the following condition: **5**
a) When the seasonal variation is relatively constant over time.

2 (a) You have just taken ownership of a pizza shop. The previous owner told you that you would save money if you bought the mozzarella cheese in a 4.5 pound slab. Each time you purchase a slab of cheese, you weigh it to ensure that you are receiving 72 ounces of cheese. The results of 7 random measurements are 70, 69, 73, 68, 71, 69 and 71 ounces. Are these differences due to chance or is the distributor giving you less cheese than you deserve? **10**
a. State the hypotheses.
b. Calculate the test statistic.
c. Would the null hypothesis be rejected at the 10% level? The 5% level? The 1% level?

(b) Elaborate moving average and exponential smoothing techniques? **10**

3 (a) Define sampling and central limit theorem ? Elaborate stratified sampling, judgment sampling , systematic sampling and cluster sampling **10**

(b) Use multiple regression derive equation for y given x1 and x2. **10**

y	x1	x2
-3.7	3	8
3.5	4	5
2.5	5	7
11.5	6	3
5.7	2	1

4 a) In a manufacturing unit, four teams of operators were randomly selected and sent to four different facilities for machining techniques training. After the training, the supervisor conducted the exam and recorded the test scores. At 95% confidence level does the scores are same in all four facilities? (Kruskal–Wallis and chi-square table) **10**

Facility 1	Facility 2	Facility 3	Facility 4
88	77	71	52
82	76	56	65
86	84	64	68
87	59	51	81

b) In the context of Multiple linear regression explain what is Over fitting & multicollinearity? **10**

5 a) 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.

b) Find the simple linear regression equation for the data given below: **10**

X	Y
2	21
4	27
6	29
8	64
10	86
12	92

6 a) Explain any 3 numerical measures for : **10**
a. Measures of variability
b. Measures of location
c. Measures of distribution shape

b) Difference between **10**
a. Parametric and non-parametric test
b. Discrete and Continuous probability distribution.

(3 Hours.) Marks = 80

NB:

1. **Question No. 1 is compulsory and solve any THREE questions from remaining questions.**
2. **Assume suitable data if necessary.**
3. **Draw clean and neat diagrams.**

Q1.		Attempt any four	
	a.	Compare and contrast Web 1.0, Web 2.0 and Web 3.0?	**5**
	b.	What is Content Management System (CMS)	**5**
	c.	Explain steps involved in Web Analytics Process.	**5**
	d.	State the advantages and disadvantages of Joomla.	**5**
	e.	State four significant N-Triples language.	**5**
Q2.	a.	What does REST Stand for? Explain REST API with a basic flow diagram.	**10**
	b.	Explain the following built in Angular JS Directives with example. a) ng-app b) ng-init	**10**
Q3.	a.	Discuss any 5 built-in helper functions in AngularJS.	**10**
	b	Explain Flask templates with an example.	**10**
Q4	a.	Explain the working of MongoDB and Applications of MongoDB.	**10**
	b.	With the help of diagram explain process involved in AJAX Asynchronous Model.	**10**
Q5	a.	What are the HTTP Methods provided by Python Flask?	**10**
	b.	Explain Drupal's architecture with its advantages.	**10**
Q6	a.	Explain different characteristics of RIA in details.	**10**
	b.	Discuss definite and indefinite loops with suitable examples in Typescript.	**10**

Duration: 3hrs **[Max Marks: 80]**

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Q.1 [20]

A List out stages in Data Mining with neat labelled diagram.

B A sales firm has reported following sales figures for FY 23-24 (i.e. March 23 to Feb 24)
2300, 435, 675, 543, 454, 7877, 5434, 345, 2342, 654, 567, 545.
Show how to normalize this data series using Min-Max scaling.

C With an example explain Star Versus Snowflakes schema in dimensional modelling

D What is market basket analysis? Explain with a real use case.

Q.2 A Draw and list the components of a typical Data warehouse architecture [10]

B Consider we have age of 35 participants in a survey given to us in sorted order. [10]
5, 10, 13, 13, 15, 16, 16, 20, 20, 20, 21, 22, 22, 22, 25, 25, 25, 25, 30, 30, 33, 33, 33, 35, 35, 35, 35, 36, 40, 45, 46, 52, 52, 70, 85.
Draw histograms for this data taking bin size as **5** and **8**. Explain the effect of bin size on the histograms you obtain.

Q.3 A What is OLAP? Explain various OLAP operations with neat labeled diagram [10]

B Explain working of decision tree based classifier? With an example explain steps for inducting tree using ID3 algorithm. [10]

Q.4 A Use the Apriori algorithm to identify the frequent item-sets in the following database. [10]

Tid	a	b	c	d	e	f	g
Items	1,2,4,5,6	2,3,5	1,2, 4,5	1,2,4, 5	1,2,3,4,5, 6	2,3,4	1,2,4,5

Consider Minimum Support as 75% and confidence at 85% level. Write down all strong association rules.

B What is an outlier? Explain various methods for performing outlier analysis. [10]

Q.5 A Explain steps in hierarchical Clustering algorithm. Perform hierarchical clustering on following data that represents 10 points in 2 D space [10]
(2,3), (5,4), (9,6), (4,7), (8,1), (7,2), (6,3), (1,9), (3,6), (4,8).
Consider you require 3 clusters.

B Explain mining of Multilevel association rules and Multidimensional association rules. [10]

Q.6 Write short note on following (Any 4) [20]

A Navie Bayes Classifier.

B Boot Straping

C BIRCH Algoirthm.

D BI Architecures

E Types of attributes

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Time: 3 HRS **Marks: 80**

Note: 1. Q. No1 is compulsory
2. Solve any three questions out of the remaining five

Q.No1 Solve any four (20)

a) Give the Features of VANET and MANET
b) Compare Infrastructures based Network and an Adhoc Network
c) Outline the method that supports mobility in CISCO Unified Wireless Network
d) Explain WEP and the security standard used
e) Explain LoraWAN

2

a. Explain the spread spectrum and briefly outline DSSS and FHSS (10)
b. Illustrate and explain GSM architecture with its interfaces. Compare GSM and UMTS (10)

3. a. Outline the WSN architecture along with neat diagrams. State the various issues in WSN (10)

b. Illustrate the RF site survey process and their importance in the design process of designing a wireless network with Lightweight AP and WLC (10)

4. a. State different features of Zigbee and explain its protocol stack (10)
b. Draw and Explain Wi-Fi Architecture and Protocol Architecture (10)

5.

a. Draw and explain OFDMA with a neat diagram (10)
b. State the Features of Wi-MAX. Draw and explain the architecture of Wi-MAX (10)

6.

a. Explain UMTS and GSM security (10)
b. Compare and contrast 1G to 5G based on the technological differences and advancements. Write a short note on Massive MIMO (10)

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(3 Hours) **[Total Marks: 80]**

N.B.: (1) Question No. **1** is **compulsory.**
(2) Solve any **three** questions out of remaining **five.**
(3) Figures to **right** indicate **full** marks.
(4) Assume suitable **data** where **necessary.**

1.			
	(a)	Define hackers, crackers and Phreakers.	**[5]**
	(b)	Discuss in detail the challenges in handling digital evidences.	**[5]**
	(c)	What volatile data can be obtained from the investigation of routers.	**[5]**
	(d)	Describe the staircase digital investigation process model.	**[5]**
2	(a)	Explain the role of the following tools in digital forensics: i) netstat ii) psloggedon iii) tcptrace iv) netcat v) cryptcat	**[10]**
	(b)	Explain process of live data collection from Windows system in detail.	**[10]**
3	(a)	What is an incident response (IR)? Describe phases of IR process in detail.	**[10]**
	(b)	Describe the various types of network monitoring techniques for data and evidence collection.	**[10]**
4	(a)	What is Mobile Forensics? What are different Mobile Forensic tools? Explain	**[10]**
	(b)	What is the significance of command-line utility dd in unix? Enumerate the steps for Simple Forensics imaging with dd,	**[10]**
5	(a)	What is network forensics? What is the standard procedure used for network forensics.	**[10]**
	(b)	Explain guidelines for incident report writing. Give one report-writing example.	**[10]**
6		**Write short notes on (any 4)**	
	(a)	Incident response methodology.	**[5]**
	(b)	Preventive measures for cybercrime.	**[5]**
	(c)	Digital Forensic Methodology.	**[5]**
	(d)	Role of Windows registry in collecting forensic evidence.	**[5]**
	(e)	E-mail forensic investigation methods.	**[5]**