Total No. of Questions : 12]

SEAT No. :

P6577

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[5872]-410

M.E. (Artificial Intelligence and Data Science/Computer Engineering Master of Data Science)

DATA SCIENCE

Mathematical Foundations for Data Science

(2017 Pattern) (Semester - I) (510301)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

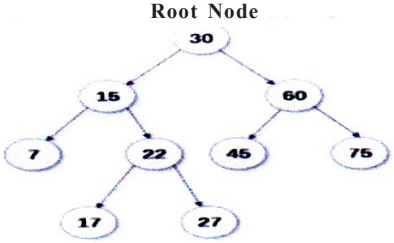
1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Prove the following by using Venn diagram **[6]**

i) $(A \cap B) \cap C = A \cap (B \cap C)$

ii) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

b) Write Preorder traversal of given Binary Search Tree **[3]**

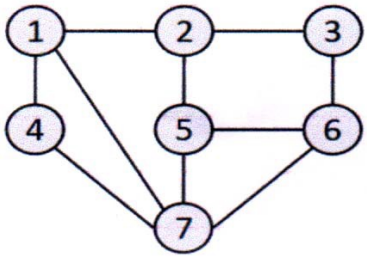


Binary Search Tree

OR

Q2) a) In a group of 100 persons, 72 people can speak English and 43 can speak French. How many can speak English only? How many can speak French only and how many can speak both English and French? **[3]**

b) Represent following given Graph using adjacency list or Adjacency Matrix. Write Depth First Search Traversal of given graph considering 2 as starting vertex. **[6]**



P.T.O.

Q3) a) For given attribute marks values : **[4]**

13, 15, 16, 16 ,19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 35, 35, 35, 35 36, 40, 45, 46, 52, 70.

Compute mean, median, mode standard deviation

b) Compare Poisson distribution and binomial distribution. **[4]**

OR

Q4) a) Explain following for numerical data using example. **[6]**

i) Quantile

ii) Five Number summary

b) A bag contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the bag, if at least one black ball is to be included in the draw? **[2]**

Q5) a) For given attribute marks values : **[5]**

10, 90, 30, 20, 50, 30, 60, 40, 70,40, 30, 60, 80, 20

Compute standard deviation, Range, Inter Quartile Range (IQR), five number summary plot it using boxplot.

b) Explain concept and application of Skewness & Kurtosis. **[4]**

OR

Q6) a) Compute covariance of age and glucose values given below **[4]**

(Age-1.5,2, 1.6, 1.2, 1.1) (Glucose -1.7,1.9,1.8,1.5,1)

b) Explain any two graphical representation methods for qualitative data.**[5]**

Q7) a) Use these methods to normalize the following group of data :

200, 300, 400, 600, 1000 **[4]**

1) sz-score normalization, 2) z-score normalization using mean absolute deviation instead of standard deviation

b) Explain any one Probabilistic models with hidden variables using example. **[4]**

OR

Q8) a) Find correlation of following data set x={2, 5, 6, 8, 9}, y={4, 3, 7, 5, 6}. **[3]**

b) Consider following dataset, predict the class label using naive Bayesian classification for tuple (T, T, T). **[5]**

A1	A2	A3	Class
T	F	T	P
T	T	F	P
T	T	T	N
T	F	F	P
T	T	T	P
F	F	F	N
F	F	T	N
F	F	F	N
T	T	T	P
T	F	F	N

Q9) a) Solve the following system of equations using LU Decomposition method : **[4]**

$X_1+X_2+X_3=1,\ 4X_1+3X_2-X_3=6,\ 3X_1+5X_2+3X_3=4$

b) List the applications of chain rule and discuss any one in detail. **[4]**

OR

Q10) a) Find the eigenvalues of the matrix **[4]**

$$\begin{bmatrix} 2 & 2 \\ 5 & -1 \end{bmatrix}$$

b) Explain two forms of Chain Rule. **[4]**

Q11) a) Overfitting and Multicollinearity with respect to regression. **[4]**

b) Find linear regression equation for the following two sets of data : **[4]**

X	1	2	3	4	5	6	7
Y	9	8	10	12	11	13	14

OR

Q12) Suppose we have the following dataset with one response variable y and two predictor variables X_1 and X_2. Fit a multiple linear regression model to this dataset. **[8]**

X_1	60	62	67	70	71	72	75	78
X_2	22	25	24	20	15	14	14	11
Y	140	155	159	179	192	200	212	215