Total No. of Questions : 12]

SEAT No. :

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PA-4317

[5929]-1050

F.Y. M.C.A. (Engineering)

DISCRETE MATHEMATICS AND STATISTICS

(2020 Pattern) (Semester - I) (310901)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10, Q11 or Q12.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*

Q1) a) How many integers between 1 - 500 are divisible by 2, 3, 5, or 7? **[6]**

b) Verify that If A & B are finite sets, then $|A \cup B| = |A| + |B| - |A \cap B|$. **[6]**

OR

Q2) a) It was found that in the first year Computer Science of 80 students know oracle, 55 know CPP and 46 know JAVA. It was also found that 37 know CPP and oracle, 28 know CPP and JAVA, 25 JAVA and oracle, 7 students does not know any language.

Find : **[6]**

i) How many know all the three languages?

ii) How many know exactly two languages?

b) Prove that that $(p \rightarrow (q \rightarrow r)) \Rightarrow (p \rightarrow q) \rightarrow (p \rightarrow r))$ **[6]**

Q3) a) For each of these relations on set A = {1,2,3,4} decide whether it is reflexive, symmetric, transitive relation **[6]**

R1 = {(1,1),(1,2),(2,2),(2,1),(3,3),(4,4)}

R2 = {(1,3),(1,4),(2,3),(2,4),(3,1),(3,4)}

b) Given a relation R = {(1,2),(2,3),(3,4),(2,1)} on A = {1, 2, 3, 4). Find the transitive closure of R by Warshall's algorithm. **[6]**

OR

P.T.O.

Q4) a) Write the following statements in symbolic forms : **[6]**

i) if I finish my homework before dinner and it does not rain, then I will go to the ball game.

ii) I will go to a movie only if I will not study discrete structures.

iii) Either the food is good or service is good, but not both.

b) Let f(x) =2x+3, g(x) =3x+4, h(x) =4x for x ∈ R, where R = set of all real numbers. Find gof, fog, foh, hof, goh. **[6]**

Q5) a) Two dice are rolled. What is the probability that the sum of the faces will not exceed 7? Given that at least one face shows a 4. **[5]**

b) Solve the following : **[6]**

i) How many different car number plates are possible with 2 letters followed by 3 digits.

ii) How many of these number plates begin with 'MH'

OR

Q6) a) Four persons are chosen at random from a group containing 3 men, 2 women and 4 children. Find the chance that exactly two of them will be children. **[6]**

b) i) Suppose repetitions are not permitted, then how many 4 digit numbers can be formed from the six digits 1, 2, 3, 5, 7, 8?

ii) How many such a numbers are less than 4000?

iii) How many numbers in (i) are even?

iv) How many numbers in (ii) are odd?

v) How many of the numbers in (i) contain both the digits 3 and 5? **[5]**

Q7) a) List and Explain Axioms of Probability Every Data Scientist Should Know? **[6]**

b) A box contains 2 white balls, 3 black balls and 4 red balls In how many ways can 3 balls be drawn from the box, if at least one black ball is to be included in the draw? **[6]**

OR

Q8) a) Define : **[6]**

i) Probability

ii) Sample space

iii) Event

b) In a class, there are 15 boys and 10 girls. Three students are selected at random. Find the probability that 1 girl and 2 boys are selected. **[6]**

Q9) a) What are the sampling methods or Sampling Techniques? Explain in Detail. **[6]**

b) Find the variance and standard deviation for the following data : 57, 64, 43, 67, 49, 59, 44, 47, 61, 59. **[6]**

OR

*Q10)*a) Explain the Types of Regression and their properties in detail. **[6]**

b) Explain Correlation Coefficient Types, Formulas with Examples. **[6]**

*Q11)*a) Find the expectation of a random variable X? use the following data **[6]**

x	0	1	2	3
f(x)	1/6	2/6	2/6	1/6

b) What are the steps of hypothesis testing? Explain Five Steps in Hypothesis Testing. **[5]**

OR

*Q12)*a) In each of 4 races, the Democrats have a 60% chance of winning. Assuming that the races are independent of each other, what is the probability by using the Binomial Distribution that : i) The Democrats will win 0 races, 1 race, 2 races, 3 races, or all 4 races? ii) The Democrats will win at least 1 race **[6]**

b) What are the three types of random variables? Explain in Detail. **[5]**