

Total No. of Questions :12]

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SEAT No. :

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[4861]-105

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

PROBABILITY AND STATISTICS

(2013 Course) (Semester - I)

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right side indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Use of probability table, electronic pocket calculator is allowed.

Q1) a) If A and B are any two events then

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \quad [4]$$

b) A husband and wife appear in a interview for two vacancies of the same post. The probability of husband's selection is  $1/7$  and that of wife's selection is  $1/5$ . What is the probability that: [4]

- i) at least one of them is selected
- ii) both of them are selected
- iii) only one of them is selected

OR

Q2) a) Three balls are drawn successively from the box containing 6 red balls, 4 white balls and 5 blue balls. Find the probability that they are drawn in the order red, white and blue if each ball is [4]

- i) Replaced
- ii) Not Replaced

b) State and prove Baye's theorem. [4]

P.T.O.

Q3) a) Let X and Y be independent random variables with  $E[X] = 3$ ,  $E[X^2] = 25$   
 $E[Y] = 10$  and  $E[Y^2] = 164$  find [4]

i)  $E[2X-3Y+7]$

ii)  $\text{var}[3X+Y-8]$

b) Verify whether a function  $f(x)$  define by [4]

$$f(x) = \begin{cases} \frac{3}{4} * (1/4)^x & x = 0, 1, 2, \dots \\ 0 & \text{Otherwise} \end{cases}$$

is probability mass function of discrete random variable X.

OR

Q4) a) If X and Y are independent random variables, prove that

$$\text{Var}(X+Y) = \text{Var}(X) + \text{Var}(Y) \quad [4]$$

b) Describe hyper geometric distribution. [4]

Q5) a) Find Moment generating function, mean and variance of a Geometric Random Variable. [6]

b) What is Uniform Distribution? [3]

OR

Q6) a) Find the mean and variance of Uniform Random Variable. [4]

b) What is reliability? Find the Reliability of K components connected in [5]

i) Series

ii) Parallel

Q7) a) What is maximum likelihood estimator? Explain the method to obtain maximum likelihood estimate. [4]

b) Define sample mean and sample median. Following are the observations on random variable X: 406, 395, 400, 450, 390, 410, 415, 401, 408. Find sample mean and median. [4]

OR

Q8) a) What is point estimator? What properties of estimator will make it a good estimator? [4]

b) Describe Central Limit Theorem. [4]

Q9) a) What is Hypothesis testing? What is significance of alpha and beta? [4]

b) A random sample of size  $n$  is selected from a normal distribution with mean  $\mu$  and variance  $\sigma^2$ . Prove that the sample mean  $\bar{X}$  is normally distributed with mean  $\mu$  and variance  $\sigma^2 / n$ . [4]

OR

Q10) a) Explain the following terms: [4]

i) Statistical Hypothesis and Null Hypothesis

ii) Level of significance

b) Write a short note on Student-t Distribution. [4]

Q11) a) Describe the chi-square test as a test of goodness of fit. Write the steps. [5]

b) Explain the term P-chart of statistical quality control. [4]

OR

Q12) a) What is acceptance sampling? [5]

b) Explain Statistical Quality control with its advantages and limitations. [4]

EEE