Subject Code: MC1314/R13

M C A - I Semester Regular/Supply Examinations, Dec/Jan – 2015-16

PROBABILITY AND STATISTICAL APPLICATIONS

Time: 3 hours **Max Marks: 60**

Answer any **FIVE** of the following

All questions carry equal marks.

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1) a) If the event A can occur along with the event E . Suppose also E can occur only in n mutually exclusive events say E_1 ,E_2 ,….E_n .Then prove that

$P(A)=\sum_{i=1}^{n} P(E_i).P(A/E_i)$ **where P(E_i) ≠0**

b) A box contains 2000 components of which 5% are defective .A second box contain 500 components of which 40% are defective .Two other boxes contain 1000 components each with 10% defective components. We select at random one of the above boxes and draw from it random a single component.

(i) What is the probability that this component is defective?

(ii) What is the probability that the selected component is defective is drawn from box 2

2) a) The cumulative distribution function of a continuous random variable X is given by

$$F(x)=\begin{cases}1-e^{-2x} & ,x>0\\ 0 & ,x<0\end{cases}$$ Then find (i) density function (ii) mean

b) Out of 24 mangoes 6 are rotten, 2 mangoes are drawn. Obtain the probability distribution function of rotten mangoes and also find mean of the distribution

3. a) Find the characteristic function of a random variable x having the following density function

$$f(x)=\begin{cases}\frac{x}{2} & ,0<x<2\\ 0 & ,otherwise\end{cases}$$

b) Fin d the moment generating function of the discrete variable x f(x) = 1/k , for x = 1,2,3,..K

4. a) The probability of man hitting a target is 1/3 , then

(i) If he fire five times, what is the probability of hitting the target at least twice?

(ii) How many times he hit so that the probability of hitting the target at least once is more than 90%

b) If X is a normal variate with mean 30 and standard deviation 5 .

Find (i) P(26<x<40) (ii) P(| x-30 | >5)

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5. A population consists of four elements 1,5,6,9. Consider all possible samples of size 2 without replacement from the population, Find

   a) Mean of the population

   b) The standard deviation of the population

   c) The mean of sampling distributions of means

   d) The Standard deviation of sampling distributions of means

6. a) Two types of batteries A and B are tested for their length of life and the following results are obtained

Battery	**Sample size**	**Mean(Hrs)**	**Variance(hrs)**
A	10	1000	100
B	12	2000	121

Is there a significant difference in the two means at 5% level?

b) An automobile manufacturer asserts that the seat belts are 90% effective. Tests of 50 seat belts of 37 are defective .Test the collection of manufacturer at 5% level of significance

7. a) Calculate the Rank correlation coefficient between the following series X and Y

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

b) Derive Normal equations for $y = ax^2+bx+c$

8. a) in a car wash service facility , cars arrive for service according to poission distribution with mean 5 per hour .The service time for washing and cleaning each car has exponential distribution with mea n 10 min per car . The facility for one car at a time and parking space is available for 5 cars then find

   (i) Effective arrival rate (ii) Expected number of parking space occupied

   b) Derive an expression for Expected number of customer's waiting in the queue

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