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Code: 4P2C13

M.C.A. I Semester Supplementary Examinations January 2018

**Probability and Statistics**

Max. Marks: 60

Time: 3 Hours

Answer all five units by choosing one question from each unit ( 5 x 12 = 60 Marks )

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**UNIT-I**

1. a) State and prove the addition theorem of Probability 5M
- b) The probabilities of A, B, C to become managers of a factory are  $\frac{1}{2}, \frac{3}{10}, \frac{1}{5}$  respectively. The probabilities that the bonus scheme will be introduced if they become managers are 0.02, 0.03, and 0.04. Determine the probability that A, B, C to become managers if the Bonus Scheme is introduced. 7M

**OR**

2. a) From a lot of 10 items containing 3 defectives, a sample of 4 items is drawn at random without replacement. Let the random variable X denotes the number of defectives in the sample, find
- i. Probability distribution of X.
- ii.  $P(X \leq 2)$  and  $P(X \geq 2)$ . 6M
- b) A random variable X has the probability density function
- $$f(x) = \begin{cases} mx(1-x), & \text{if } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$
- i. Evaluate the constant  $m$
- ii. Find the mean and variance of X . 6M

**UNIT-II**

3. a) Find the mean and variance of the Uniform distribution. 6M
- b) The marks obtained in an examination are found to be normally distributed. If 15% of the students get more than 60 marks and 40% of the students get less than 30 marks, find the mean and standard deviation of the marks. 6M

**OR**

4. a) Find the mean and variance of the Poison distribution. 6M
- b) Let a committee has 77 members, find the probability of having more female members than male members given that the probability of having a male or female member is equal. 6M

**UNIT-III**

5. A population consists of 5 numbers 3, 6, 9, 15, 27. Consider all possible samples of size 3 which can be drawn from this population. Find
- i. Population mean.
- ii. Population standard deviation.
- iii. Mean of the sampling distribution of means.
- iv. Standard deviation of the sampling distribution of means. 12M

**OR**

6. a) Explain point estimation and interval estimation in detail. 6M
- b) In a random sample of 160 workers exposed to a certain amount of radiation, 30 workers severely affected. Construct a 99% confidence interval for the corresponding true percentage. 6M

**UNIT-IV**

7. a) A die is thrown 256 times. An even digit turns up 156 times. Can we say that die is unbiased? 8M
- b) Explain Type-I and Type-II errors. 4M

**OR**

8. A manufacturer claimed that at least 95% of the equipment which she supplied to a factory conformed to specifications. An examination of a sample of 200 pieces of equipment revealed that 185 were faulty. Test her claim at a significance level of 0.05. 12M

**UNIT-V**

9. a) Explain the characteristics of an M/M/1 model briefly. 6M
- b) A person repairing watches finds that the time spent on a watch has an exponential distribution with mean 20 minutes. If the watches are repaired in the order in which they arrive and their arrival is approximately poisson distributed with an average of 15 per 8-hour day. What is the repairman's expected idle time each day? 6M

**OR**

10. Customers arrive at the ration shop in poisson fashion with an average of a customer every 10 minutes. If the service time is 5 minutes, then find
- i. Average number of customers in the system
  - ii. Average waiting time.
  - iii. Average length of waiting line. 12M

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