

Code: 06MC104

MCA I Semester Supplementary Examinations August 2014

**PROBABILITY & STATISTICS**

(For 2008 admitted students only)

Time: 3 hours

Max. Marks: 60

Answer any FIVE questions  
All questions carry equal marks

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- 1 (a) A and B throw alternatively with a pair of dice one who first throws a total of nine wins. What are their respective chances of winning if A starts the game?  
(b) Define conditional probability. State and prove Baye's theorem.
- 2 (a) (i) Define discrete distributive function.  
(ii) Given that  $f(x) = k/2^x$  is a probability distribution for a random variable X that can take on the values  $x = 0, 1, 2, 3$  and 4. Find k, mean and variance of x.  
(b) (i) Define continuous distributive function.  
(ii) The cumulative distribution function for a continuous random variable X is  $F(x) = \begin{cases} 1 - e^{-2x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$  then find density function  $f(x)$ , mean and variance.
- 3 (a) It has been found that 2% of the tools produced by a certain machine are defective. What is the probability that in a shipment of 400 such tools:  
(i) 3% or more  
(ii) 2% or less will prove defective.  
(b) List the properties of normal distribution.
- 4 (a) Find the mean and standard deviation of sampling distribution of variances for the population 2, 3, 4, 5 by drawing samples of size two  
(i) with replacement  
(ii) without replacement.  
(b) What is the effect on standard error, if a sample is taken from an infinite population of sample size increased from 400 to 900?
- 5 (a) Prove that for a random sample of size n,  $x_1, x_2, \dots, x_n$  taken from an infinite population  $S^2 = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2$  is not an unbiased estimator of the parameter  $\sigma^2$  but  $\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2$  is unbiased.  
(b) A random sample of size 100 is taken from a population with  $\sigma = 5.1$ . Given that the sample mean is  $\bar{x} = 21.6$ , construct a 95% confidence interval for the population mean  $\mu$ .
- 6 (a) In 64 randomly selected hours of production, the mean and the standard deviation of the number of acceptance pieces produced by an automatic stamping machine are  $x = 1.038$  and  $\sigma = 0.146$   
(b) In an investigation on the machine performance the following results are obtained.

	No. of units inspected	No. of defectives
Machine 1	375	17
Machine 2	450	22

Test whether there is any significant performance of two machines at  $\alpha = 0.05$ .
- 7 (a) Explain student – distribution, its properties and applications.  
(b) The mean life time of a sample of 25 fluorescent light bulbs produced by a company is computed to be 157 hours with a S.D of 120 hours. The company claims that the average life of the bulbs produced by the company is 1600 hours using the level of significance of 0.05. Is the claim acceptable?
- 8 (a) Write characteristics of (m/m/1): ( $\infty$ /FIFO) model.  
(b) What is queuing problem?

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