**[Total No. of Questions - 9] [Total No. of Printed Pages - 4]**
**(2123)**

**1363**

**B. Tech 3rd Semester Examination**

**Probability and Statistics (O.S.)**

**AS-3011**

**Time : 3 Hours** **Max. Marks : 100**

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

**Note :** Attempt five questions in all, select one question from each section A, B, C and D. Section E (question 9) is compulsory. Use of non programmable calculator is allowed.

## SECTION - A

1. (a) Box A contains 5 red and 3 white marbles and Box B contains 2 red and 6 white marbles. If a marble is drawn from each box, what is the probability that they are both of the same colour? **(10)**

   (b) Find k such that f(x) is a probability density function of a continuous random variable x, where f(x) is defined as follows

$$f(x) = \begin{cases} kxe^{-x}, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$

   Also find the expected value. **(10)**

2. (a) The number of components manufactured in a factory during a one month period is a random variable with mean 600 and variance 100. What is the probability that the production will be between 500 and 700 over a month. **(10)**

(b) A and B throw alternately with a pair of ordinary dice. A wins if he throws 6 before B throws 7 and B wins if he throws 7 before A throws 6. If A begins, find his chance of winning. **(10)**

## SECTION - B

3. (a) Given that the mean of the distribution is 5, variance is 9 and the moment coefficient of skewness is -1, find the first three moments about origin. **(10)**

(b) Calculate the coefficient of skewness from the following data

| Size | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Frequency | 10 | 18 | 30 | 25 | 12 | 3 | 2 |

**(10)**

4. (a) The first four moments of a distribution about the origin are 1, 4, 10 and 46 respectively. Obtain the various characteristics of the distribution on the basis of the information given. Comment upon the nature of the distribution. **(10)**

(b) Calculate Arithmetic Mean from the following data:

| Wages in Rs. | Below 100 | 100-109 | 110-119 | 120-129 | 130-139 | 140-149 | 150 & above |
|---|---|---|---|---|---|---|---|
| No. of Workers | 10 | 15 | 25 | 40 | 28 | 12 | 20 |

**(10)**

## SECTION - C

5. (a) If 3% of the electric bulbs manufactured by a company are defective, find the probability that in a sample of 100 bulbs (a) 0, (b) 1, (c) 2 bulbs are defective? Find the probability that (i) more than 5, (ii) between 1 and 3 bulbs will be defective? **(10)**

(b) A normal population has a mean of 6.8 and standard deviation of 1.5. A sample of 400 members gave a mean of 6.75. Is the difference significant? **(10)**

6. (a) If the probability that an individual will suffer a bad reaction from injection is 0.001. Determine the probability that out of 2000 individuals, (a) exactly 3, (b) more than 2 individuals will suffer a bad reaction? **(10)**

(b) Suppose that a Technical University has to form a committee of 5 members from a list of 20 candidates out of whom 12 are teachers and 8 are students. If the members of the committee are selected at random, what is the probability that the majority of the committee members are students? **(10)**

## SECTION - D

7. (a) A machine is designed to produce insulating washers for electrical device of average thickness 0.025 cm. A random sample of 10 washers was found to have a thickness 0.024 cm, with S.D. of 0.002 cm. Test the significance of the deviation (value of 't' for 9 degree of freedom at 5% level of significance is 2.262). **(10)**

(b) 4 coins are tossed 160 times and the following results were obtained:

| Number of Heads | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Observed Frequencies | 17 | 52 | 54 | 31 | 6 |

Under the assumption that coins are balanced, find the expected frequencies of getting 0, 1, 2, 3 or 4 heads and test the goodness of fit. (given that the table value of $\chi^2$ = 9.488 at 5% level of significance). **(10)**

8. (a) What is two way classification with one observation per cell in ANOVA? Give the mathematical model and the underlying assumptions. **(10)**

   (b) In a survey of 200 boys of which 75 were intelligent, 40 have skilled fathers, while 85 of the unintelligent boys had unskilled fathers. Do these figures support the hypothesis that skilled fathers have intelligent boys? (value of $\chi^2$ = 3.841 for 1 degree of freedom) **(10)**

## SECTION - E

9. Write a short note on the following:

   (i) Baye's theorem

   (ii) Continuous random variables

   (iii) Measure of central tendency

   (iv) Skewness and kurtosis

   (v) Analysis of variance (ANOVA)

   (vi) Mathematical Expectation

   (vii) Sampling Distribution

   (viii) Standard error

   (ix) Partial and Multiple Regression

   (x) Advantage of method of least square **(10×2=20)**