[This question paper contains 2 printed pages.]

Sr. No. of Question Paper : 312 E Your Roll No......

Unique Paper Code : 290662

Name of the Course : B.A. (Prog.) Application Course

Name of the Paper : Basic Mathematical Statistics - II

Semester : VI

Duration: 2 Hours Maximum Marks: 55

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Question No. 1 is compulsory.

3. Attempt any four questions from Question numbers 2 to 7 selecting at least one from each of the Section I, II, and III.

4. Give full explanation for each question.

5. Marks are indicated against each question.

6. Use of Simple Calculator is allowed.

7. Candidates can ask for Log/Statistical Tables.

1. Short answers with proper justification are expected in all the five parts of this question. Each part is of 3 marks. (3×5=15)

- (i) Find the probability distribution of the number of girls in families with 4 children, assuming equal probabilities for boys and girls.
- (ii) Find the expected value of the number of Tails in three tosses of a coin.
- (iii) If X is a normal variable with mean 0 and standard deviation 1, find the probability that X lies between 2 and 3.
- (iv) Find the value of the constant k for which

$$f(x) = kx(x+1), \ 0 \le x \le 1$$

represents the probability density function of a continuous random variable X.

(v) If 5% of the electric bulbs manufactured by a company are defective, use Poisson distribution to find the probability that in a sample of 100 bulbs none is defective, given that $e^{-5} = 0.007$.

SECTION I

- It is known from past experience that in a certain plant there are on the average 4 industrial accidents per month. Find the probability that in a given year there will be less than 4 accidents. Assume poisson distribution (e⁻⁴ = 0.0183). (10)
- 3. Let X be a normal variable with standard deviation 10 and mean 50. Find the probability that
 - (i) X lies between 30 and 60
 - (ii) $X \ge 75$

$$(iii) X \le 45 \tag{10}$$

SECTION II

- 4. Out of 400 persons who were given a flu vaccine, 136 experienced some discomfort. Construct a 95% confidence interval for the true proportion of persons who will experience some discomfort from the vaccine. (10)
- 5. An electrical firm manufactures light bulbs that have a length of life that is approximately normally distributed, with mean equal to 800 hours and a standard deviation of 40 hours. Find the probability that a random sample of 16 bulbs will have an average life of less than 775 hours. (10)

SECTION III

6. Two random samples drawn from two normal populations are

Sample 1: 20 16 26 27 23 22 18 24 25 19

Sample 2: 27 33 42 35 32 34 38 28 41 43 30 37

Test if the two populations have the same variance at 5% level of significance. Given that $F_{0.05,9.11} = 3.1$. (10)

The average concentration of zinc recovered from samples of zinc measurement from 36 different locations in a river is found to be 2.6 grams per milliliter. Find a 95% and a 99% confidence interval for the mean zinc concentration in the river. Assume that the population standard deviation is 0.3. Given Z_{0.025} = 1.96 and Z_{0.005} = 2.575.

(200)