

Code: IT3T3

**II B.Tech - I Semester–Regular/Supplementary Examinations  
November 2019**

**PROBABILITY AND STATISTICS  
(INFORMATION TECHNOLOGY)**

Duration: 3 hours

Max. Marks: 70

**PART – A**

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

- a) What are axioms of probability?
- b) What is the probability that a non-leap year contains 53 Sundays?
- c) Average number of accidents on any day on a national highway is 1.8. Determine the probability that the number of accidents are at least one.
- d) The mean and variance of a Binomial distribution are 4 and  $\frac{4}{3}$  respectively. Find  $P(X \geq 1)$ .
- e) If  $X$  is a random variable and  $a$  and  $b$  are constants, then prove that  $E(aX + b) = aE(X) + b$ .
- f) When a sample is taken from an infinite population, what happen to standard error of the mean if the sample size is decreased from 800 to 200?
- g) What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with at least 95% confidence.
- h) Write about one tailed and two tailed tests.
- i) Define critical and acceptance regions in test of hypothesis.
- j) What are the types of ANOVA?
- k) What is the significance of  $F$  – test.

## PART – B

Answer any **THREE** questions. All questions carry equal marks.

$$3 \times 16 = 48 \text{ M}$$

2. a) In a bolt factory machines A, B, C manufacture 20%, 30% and 50% of the total of their output and 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective. Find the probabilities that it is manufactured from (i) Machine A (ii) Machine B (iii) Machine C.

8 M

- b) A random variable X has the following probability function

x	0	1	2	3	4	5	6	7
p(x)	0	2K	2K	2K	3K	K <sup>2</sup>	2K <sup>2</sup>	7K <sup>2</sup> + K

Determine (i) K (ii) Mean (iii) Variance

8 M

3. a) Show that mean and variance of Poisson distribution are equal.

8 M

- b) In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal, find

- (i) How many students score between 12 and 15?  
(ii) How many score above 18?  
(iii) How many score below 8?

8 M

4. a) A population consists of six numbers 4, 8, 12, 16, 20 and 24. Consider all possible samples of size two which can be drawn without replacement from this population. Find

8 M

- (i) The mean of the population
- (ii) The standard deviation of the population
- (iii) The mean of the sampling distribution of means
- (iv) The standard deviation of the sampling distribution of means.

b) A random sample of 400 items is found to have mean 82 and standard deviation of 18. Find the maximum error of estimation at 95% confidence interval. Find the confidence limits for the mean if  $\bar{x} = 82$ .

8 M

5. a) It is claimed that a random sample of 49 tyres has a mean life of 15200 km. This sample was drawn from a population whose mean is 15150 km and a standard deviation of 1200 km. Test the significance at 0.05 level.

8 M

b) Two independent samples of 8 and 7 items respectively had the following values

Sample I	11	11	13	11	15	9	12	14
Sample II	9	11	10	13	9	8	10	-

Is the difference between the means of samples significant?

8 M

6. a) In an investigation on the machine performance, the following results are obtained.

Machine	No. of units inspected	No. of units defectives	Total
Machine 1	375	17	392
Machine 2	450	22	472
Total	825	39	864

Test whether there is any significant performance of two machines at  $\alpha = 0.05$ . 8 M

b) The measurements of the output of the two units have given the following results. Test whether the two populations have the same variance, assuming that both samples have been obtained from the normal population at 5% significant level. 8 M

Unit A	14.1	10.1	14.7	13.7	14.0
Unit B	14.0	14.5	13.7	12.7	14.1