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# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech III Semester End Examinations(Regular) - November, 2019

**Regulation: IARE – R18**

## PROBABILITY AND STATISTICS

**Time: 3 Hours**

**(Common to AE | ME)**

**Max Marks: 70**

**Answer ONE Question from each Unit**

**All Questions Carry Equal Marks**

**All parts of the question must be answered in one place only**

### UNIT – I

1. (a) Define event, mutually exclusive events and equally likely events. [7M]
- (b) The two bolts are drawn from a box containing 4 good and 6 defective bolts. Find the probability that the second bolt is good if the first one is found to be defective. [7M]
2. (a) Explain the concept of expectation of a random variable. [7M]
- (b) If the probability density function  $f(x) = \begin{cases} kx^3 & \text{if } 1 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$  Find the value of k and find the probability between  $x = \frac{1}{2}$  and  $x = \frac{3}{2}$ . [7M]

### UNIT – II

3. (a) Define the Poisson distribution and find the mean of the Poisson distribution. [7M]
- (b) If X is a normal variant with mean 30 and standard deviation 5 find
  - i)  $P(26 < X < 40)$
  - ii)  $P(X > 45)$[7M]
4. (a) Define normal distribution find the mean of normal distribution. [7M]
- (b) In a binomial distribution consisting of 5 independent trials, probabilities of 1 and 2 success are 0.4096 and 0.2048 respectively. Find the parameter P of distribution. [7M]

### UNIT – III

5. (a) The ranks of the 15 students in two subjects A and B are given below, the two numbers within the brackets denoting the ranks of the same student in A and B respectively. (1,10), (2,7), (3,2), (4,6), (5,4), (6,8), (7,3), (8,1), (9,11), (10,15), (11,9), (12,5), (13,14), (14,12), (15,13) Use Spearman's formula to find the rank correlation coefficient. [7M]
- (b) Calculate the coefficient of correlation between the age of cars and annual maintenance cost from the following Table 1 and comment on the result. [7M]

Table 1

X	48	33	40	9	16	16	65	24	16	57
Y	13	13	24	6	15	4	20	9	16	19

6. (a) Define correlation coefficient. Explain types of correlation. Write the properties of correlation coefficient. [7M]
- (b) Calculate the regression equation of y on x from the data given in Table 2. [7M]

Table 2

X	10	12	13	16	17	20	25
Y	10	22	24	27	29	33	37

#### UNIT – IV

7. (a) Define population? Give an example. Write a short note on critical region. [7M]
- (b) In a random sample of 125 cola drinkers, 68 said they prefer thumsup to pepsi. Test the null hypothesis  $P=0.5$  against the alternative hypothesis  $P > 0.5$ . [7M]
8. (a) Demonstrate test of significance for difference of means. [7M]
- (b) It is claimed that a random sample of 49 tyres has a mean life of 15,200km. This sample was drawn from a population whose mean is 15,150 km and a standard deviation of 1200 km. Test the significance at 0.05 level. [7M]

#### UNIT – V

9. (a) Define the statistics “t” and write down sampling distribution. [7M]
- (b) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test the hypothesis (at 5% level) that the two variances are equal. [7M]
10. (a) Define degree of freedom. What is the degree of freedom for F test? Write the formulae for sample variance and sample standard deviation. [7M]
- (b) In one sample of 8 observations the sum of the squares of deviations of the sample values from the sample mean was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5% level. [7M]