INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Four Year B.Tech III Semester End Examinations (Supplementary) - July, 2018
Regulation: IARE – R16
PROBABILITY AND STATISTICS

Time: 3 Hours   **(Common to ME | CE)**   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) A box contains 12 items of which four are defective. A sample of 3 items are selected from the box. Let X denote the number of defective items in the sample. Find the probability distribution of X. Determine the mean and variance. **[7M]**

   (b) In an examination 7% of students score less than 35 marks and 89% of students score less than 63 marks. Find the mean and standard deviation. **[7M]**

2. (a) Obtain mean and variance of Poisson distribution. **[7M]**

   (b) 4 coins are tossed 100 times and the results obtained are shown in Table 1. Fit a binomial distribution for the data and calculate the theoretical frequencies. **[7M]**

Table 1

No. of heads:	0	1	2	3	4
Frequency:	5	29	36	25	5

UNIT – II

3. (a) If the joint probability function of random variables x and y is given by **[7M]**

$$f(x,y) = \begin{cases} \frac{1}{8}(6 - x - y), \ 0 < x < 2, \ 2 < y < 4 \\ 0, \ otherwise \end{cases}$$

   Find
   i. $P(x < 1, \ y < 3)$,
   ii. $P(x + y < 3)$

   (b) Find the lines of regression for the data shown in Table 2: **[7M]**

Table 2

x:	10	14	18	22	26	30
y:	18	12	24	6	30	36

4. (a) Obtain the rank correlation coefficient for the following data shown in Table 3: **[7M]**

Table 3

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

(b) Two random variables X and Y have joint probability density function **[7M]**

$$f(x, y) = \begin{cases} \frac{1}{3}(x + y); & 0 \le x \le 1, \, 0 \le y \le 2 \\ 0, \; otherwise \end{cases}$$

Find marginal probability density function of X and Y.

UNIT – III

5. (a) The mean and S.D. of maximum loads of supported by 60 cables are 11.09 tonnes and 0.73 tonnes respectively. Find **[7M]**
   i. 95%
   ii. 99% confidence limits for mean of the maximum loads of all cables produced by the company.

(b) A population consists of a 4 numbers 3, 7, 11, 15 **[7M]**
   i. Find mean and variance of sampling distribution of means by considering samples of size 2 with replacement
   ii. Population mean and variance.

6. (a) Define i) Standard error ii) Point estimation iii) Null hypothesis iv) Critical region. **[7M]**

(b) The mean and standard deviation of the diameters of a sample of 250 rivet heads manufactured by a company are 7.2642mm and 0.0058mm respectively. Find 99% and 98% confidence limits for the mean diameter of all rivet heads manufactured by the company. **[7M]**

UNIT – IV

7. (a) In a large city A, 20% of a random sample of 900 school boys had a slight physical defect. In another large city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? Test at 5% LOS. **[7M]**

(b) A machine is producing bolts of which a certain fraction is defective. A random sample of 400 is taken from a large batch and is found to contain 30 defective bolts. Does this indicate that the proportion of defectives is larger than that claimed by the manufacturer where the manufacturer claims that only 5% of his products are defective? **[7M]**

8. (a) A cigarette manufacturing firm claims that its brand A of the cigarettes outsells its brand B by 8%. If it is found that 42 out of a sample of 200 smokers prefer brand A and 18 out of another sample of 100 smokers prefer brand B, test whether 8% difference is a valid claim. (Use 5% level of significance). **[7M]**

(b) The average income of persons was Rs.210 with a S.D of Rs.10 in a sample of 100 people of a city, for another sample of 150 persons; the average income was Rs.220 with a S.D of Rs.12. The S.D of income of people of the city was Rs.11. Test whether there is any significant difference between the average income of localities. **[7M]**

9. (a) Fit a Poisson distribution for the data shown in Table 4 and test the goodness of fit   **[7M]**

Table 4

x:	0	1	2	3	4	5	6
y:	275	72	30	7	5	2	1

   (b) The mean weekly sales of soap bars in departmental stores was 146.3 bars per store. After an advertising campaign the mean weekly sales in 22 stores for a typical week increased to 153.7 and showed a S.D. of 17.2. Was the advertising campaign successful?   **[7M]**

10. (a) Records taken of the number of male and female births in 800 families having four children are Shown in Table 5:   **[7M]**

Table 5

No. of male births:	0	1	2	3	4
No. of female births:	4	3	2	1	0
No. of families:	32	178	290	236	94

Test whether the data is consistent with the sympothesis that the Binomial law holds and the chance of male birth equal to that of female birth.

   (b) In order to determine whether there is significant difference in the durability of 3 makes of computers, samples of size 5 are selected from each make and the frequency of repair during the first year of purchase is observed. The results are as shown in Table 6:   **[7M]**

Table 6

A	B	C
5	8	7
6	10	3
8	11	5
9	12	4
7	4	1

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