Hall Ticket No | | | | | | | | | | | Question Paper Code: AHS010

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech III Semester End Examinations (Regular) - November, 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 random variable X has the density function:

$$f(x) = Cx\,(2-x)\,,\ if 0 \le x \le 2$$

$$= 0, \quad otherwise.$$

Determine C and find mean and variance of x. **[7M]**

(b) The probability that the noise level of a wide-band amplifier will exceed 2 dB is 0.05. Find the probabilities that among 12 such amplifiers the noise level of

(i) One will exceed 2 dB

(ii) At most two will exceed 2 dB

(iii) Two or more will exceed 2 dB. **[7M]**

2. (a) A random variable x has the following probability function as shown in Table 1:

Table 1

X	0	1	2	3	4	5	6	7
P(x)	0	k	2k	2k	3k	k^2	2 k^2	7 k^2+k

Compute (i) E (x) (ii)E(2x-3) (iii) V (x) (iv) V(x+3) **[7M]**

(b) The time required to assemble a piece of machinery is a random variable having approximately a normal distribution with $\mu = 12.9$ minutes and $\sigma = 2.0$ minutes. What are the probabilities that the assembly of a piece of machinery of this kind will take

(i) at least 11.5 minutes

(ii) anywhere from 11.0 to 14.8 minutes. **[7M]**

UNIT – II

3. (a) The joint probability mass function of (x, y) is given by $P\,(x, y) = k\,(2x + 3y)$, $x = 0, 1, 2$ and $y = 1, 2, 3$. Find

(i) The value of k

(ii) The marginal distributions.

[7M]

(b) The ranking of 10 students in two subjects A and B are as shown in Table 2:

Table 2

A:	3	5	8	4	7	10	2	1	6	9
B:	6	4	9	8	1	2	3	10	5	7

Calculate the rank correlation coefficient.

[7M]

4. (a) From the following joint distribution of X and Y as shown in Table 3

Table 3

X/Y	1	2	3	4	5	6
0	0	0	1/32	2/32	2/32	3/32
1	1/16	1/16	1/8	1/8	1/8	1/8
2	1/32	1/32	1/64	1/64	0	2/64

Find
(i) $P(X \leq 1)$
(ii)$P(1 < X < 3)$

[7M]

(b) The following scores shown in Table 4, eight students obtained in the midterm 1 and 2 examinations in a course in Probability and Statistics:

Table 4

Mid Term 1 Examinations (X)	22	26	29	30	31	31	34	35
Mid Term 2 Examinations (Y)	20	20	21	29	27	24	27	31

Find the regression equations.

[7M]

UNIT – III

5. (a) Construct sampling distribution of means for the population 2, 5, 9, 11 by drawing sample of size two with replacement. Determine (i) population mean (ii) population variance (iii) the mean of sampling distribution of means (iv) standard error. **[7M]**

(b) A random sample of size 100 is taken from an infinite population having the mean $\mu = 76$ and the variance is 256. What is the probability that $\bar{Y}$ will be between 75 and 78? **[7M]**

6. (a) If ordered samples of size n=2 are drawn with replacement from the population {2, 4, 6, 8}. Determine (i) population mean (ii) population variance (iii) the mean of sampling distribution of means (iv) standard error. **[7M]**

(b) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs. 487 with a standard deviation Rs.48. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 472 to 502? **[7M]**

UNIT – IV

7. (a) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in fovour of the proposal. Test the hypothesis that proportions of men and women in fovour of the proposal are the same against that they are not at 5% level. **[7M]**

   (b) A random sample of size 500, the mean is found to be 20. In another independent sample of size 400, the mean is 15. Could the samples have been drawn from the same population with S.D. 5? **[7M]**

8. (a) The mean of two samples of 1000 and 2000 members are respectively 67.5 and 68 inches. Can they be regarded as drawn from the same population with S.D. 2.5 inches? **[7M]**

   (b) In a certain city 380 men out of 800 are found to smokers. Discuss whether this information supports the view that majority of men in this city are non-smoker? **[7M]**

UNIT – V

9. (a) A sample of 26 bulbs gives a mean life of 900 hours with S.D. of 20 hours. The manufactures claims that the mean life of bulbs is 1000 hours. Is the sample not upto the standard? **[7M]**

   (b) The following data shown in Table 5 represent the number of units of production per day turned out by four randomly chosen operators using three machines.

Table 5

Operators	M1	M2	M3
1	150	151	156
2	147	159	155
3	141	146	153
4	154	152	159

Carry out analysis of variance and write your conclusion. **[7M]**

10. (a) A trucking firm is suspicious of the claim that the average life time of certain tires is at least 28,000 miles. To check the claim, the firm puts 40 of these tires on its trucks and gets a mean life time of 27,462 miles with a S.D of 1,348 miles. What can it conclude if the probability of a type-I error is to be at most 0.01? **[7M]**

(b) The internal bonding strength of 3 different resins ED, MD and PF need to be compared. Five specimens were prepared with each of the resins.Test at the level of significance of 0.01 whether the differences among the sample means can be attributed to chance. **[7M]**

Table 6

Resin	Strength				
ED	0.99	1.19	0.79	0.95	0.90
MD	1.11	1.53	1.37	1.24	1.42
PF	0.83	0.68	0.94	0.86	0.57

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