Hall Ticket No | | | | | | | | | | | Question Paper Code: AHSB12

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Regular/Supplementary) - July, 2021

Regulation: R18

PROBABILITY AND STATISTICS

Time: 3 Hours **(CE)** **Max Marks: 70**

Answer FIVE Questions choosing ONE question from each module
(NOTE: Provision is given to answer TWO questions from any ONE module)
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) If the probability that a communication system will have high fidelity is 0.81 and the probability that it will have high fidelity and high selectivity is 0.18, what is the probability that a system with high fidelity will also have high selectivity? **[7M]**

   (b) For the data shown in Table 1, find the probability distribution and cumulative distribution of X by finding k value. **[7M]**

Table 1

$X = x_i$	1	2	3	4
$P[X = x_i]$	K/2	K/3	K	K/5

2. (a) A box contains 7 red and 13 blue balls. Two balls are selected at random and are discarded without their colours being seen. If a third ball is drawn randomly and observed to be red, what is the probability that both of the discarded balls were blue? **[7M]**

   (b) Find the mean and variance of the random variable X whose probability function is given by **[7M]**

$$f(x) = \begin{cases} x & 0 < x \leq 1 \\ 2 - x & 1 \leq x < 2 \end{cases}$$

MODULE – II

3. (a) If 6 dice are thrown 729 times, then find the number of times that atleast three dice to show 5 or 6. **[7M]**

   (b) A manufacturer of pins knows that 2% of his products are defective. If he sells pins in boxes of 100 and guarantees that not more than 4 pins will be defective. What is the probability that a box will fail to meet the guaranteed quality ? **[7M]**

4. (a) An electric firm manufactures light bulbs that have a life, before burn-out, that is normally distributed with mean equal to 800 hours and a standard deviation of 40 hours. Find
   i) The probability that a bulb burns more than 834 hours.
   ii) The probability that bulb burns between 778 and 834 hours. **[7M]**

(b) The average number of phone calls per minute coming into a switch board between 2 P.M. and 4 P.M. is 2.5. Estimate the probability that during one particular minute i) 4 or fewer calls ii) more than 6 calls. **[7M]**

MODULE – III

5. (a) Let X be a random variable with mean 3 and variance 2 and Y= -6X+22. Find the mean of Y and the correlation coefficient between X and Y. **[7M]**

   (b) Find the rank correlation co-efficient from the data shown in Table 2: **[7M]**

Table 2

Rank in X	1	6	5	10	3	2	4	9	7	8
Rank in Y	6	4	9	8	1	2	3	10	5	7

6. (a) The equations of two regression lines are 3x+2y=26 and 6x+y=31. Find mean values of X and Y. Also calculate the correlation coefficient between X and Y. **[7M]**

   (b) From the following data shown in Table 3, find the two regression equations. **[7M]**

Table 3

X	25	28	35	32	31	36	29	38	34	32
Y	43	46	49	41	36	32	31	30	33	39

MODULE – IV

7. (a) Write a short notes on the following
   i) Population
   ii) Sampling and it's types
   iii) Type I and type II errors
   iv) Acceptance region. **[7M]**

   (b) A sample of 100 light bulbs has a mean 1570 hours and standard deviation 20 hours. Is the sample from a large population of mean 1600 hours with 5% level of significance. (Test value of Z at 5% level is $|Z|<1.96$) **[7M]**

8. (a) The means of two large samples of 1000 and 1200 members are 67.42 inches and 67.25 inches respectively. The standard deviations are 2.58 inches and 2.50 inches respectively. Is the difference between means significant? **[7M]**

   (b) In a year,there were 956 births in a town A of which 52.5% were male, while in towns A and B combined this proportion in a total of 1406 births was 0.496. Is there any significant difference in the proportion of male births in the two town? **[7M]**

MODULE – V

9. (a) Ten oil tins are taken from an automatic filling machine. The mean weight of the tins is 15.8 kg and standard deviation 0.50 kg. Does the sample mean differ significantly from the intended weight 16 kg? **[7M]**

(b) A group of 10 rats fed on diet A and another group of 8 rats fed on diet B, recorded the increase in weight as shown in Table 4. Does it show the superiority of diet A over diet B basing on means. **[7M]**

Table 4

Diet A	5	6	8	1	12	4	3	9	6	10
Diet B	2	3	6	8	1	10	2	8	-	-

10. (a) Two independent samples of size 9 and 7 from a normal population had the following values of the variables given in Table 5. Does the estimates of population variance differ significantly at 5% level? **[7M]**

Table 5

Sample I	18	13	12	15	12	14	16	14	15
Sample II	16	19	13	16	18	13	15	-	-

(b) The following data shown in Table 6 gives the number of aircraft accidents that occurred during the various days of a week. Find whether the accidents are uniformly distributed over the week.

Table 6

Days	Mon	Tue	Wed	Thu	Fri
No. of accidents	8	12	9	14	17

[7M]