

6. (a) The mean life time of sample of 100 fluorescent light bulbs produced by a company is computed to be 1570 hours with standard deviation of 120 hours. The company claims that the average life time of the bulbs produced by it is 1600 hours. Using the level of significance of 0.05 is the claim acceptable. **5**

(b) An I.Q. test was administrated to 5 persons before and after they are trained. The results are given below :

| Candidates | I.Q. before Training | I.Q. after Training |
|------------|-------------------------|------------------------|
| A | 110 | 120 |
| B | 120 | 118 |
| C | 123 | 125 |
| D | 132 | 136 |
| E | 125 | 121 |

Test whether there is any change is I.Q. after the training. It is given that $t_{0.1} = 4.6$ for 4 d.f.

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B.Tech. EXAMINATION, 2022

Semester III (CBCS)

PROBABILITY AND STATISTICS

(Common for B.Tech. all Branches)

MA-301

Time : 3 Hours

Maximum Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *Five* questions in all; selecting *one* question from each Sections A, B, C and D. Q. No. **9** is compulsory.

Section A

1. (a) A bag contains 5 red and 3 green balls while a second bag contains 3 red and 5 green balls. One ball is drawn from the first bag and two

from the second bag. Find the probability that of the three balls drawn, two are red and one is green. 5

(b) Bag I contains 4 white balls and 2 black balls, while Bag II contains 3 white balls and 3 black balls. Two balls are drawn (without replacement) at random from one of the bags and were found to be one white and one black. Find the probability that the balls were drawn from Bag II. 5

2. (a) An urn contains 4 white and 6 red balls. Four balls are drawn at random from the urn. Find the probability distribution of the number of white balls. 5

(b) Two cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the mean and standard deviation of the number of kings. 5

Section B

3. (a) Write a short note on Poisson probability distribution. 5

(b) If X is a Poisson variable such that $P(x = 2) = 9P(x = 4) + 90P(x = 6)$, find the mean and variance of X . 5

4. (a) What is the probability of guessing correctly at least six of the ten answers in a True-False objective test ? 5

(b) An urn contains 3 white balls and 6 red balls. Four balls are drawn one by one with replacement from the urn. Find the probability distribution of the number of red balls drawn. Also, find mean and variance of the distribution. 5

Section C

5. (a) What are merits and demerits of simple random sampling ? 5

(b) In a random selection of 64 of 600 road crossing in a town, the mean number of automobile accidents per year was found to be 4.2 and the sample standard deviation was 0.8. Construct a 95% confidence interval for the mean number of automobile accidents per crossing per year. 5

Section D

7. (a) An airline claims that the typical flying time between two cities is 56 minutes.
- (i) Formulate a test of hypothesis with the intent of establishing that the populations mean flying time is different from the published time of 56 minutes.
- (ii) What error could be made if the true mean is 56 minutes ? 5
- (b) To test the effectiveness of inoculation against cholera, the following table was obtained :

| | Attached | Not attached | Total |
|----------------|-----------------|---------------------|--------------|
| Inoculated | 30 | 160 | 190 |
| Not Inoculated | 140 | 460 | 600 |
| Total | 170 | 620 | 790 |

Use Chi-square test to defend or refuse the statement that the inoculation prevents attack from cholera. 5

8. (a) From the following that, calculate the coefficient of rank correlation between X and Y : 5

| X | Y |
|----------|----------|
| 32 | 40 |
| 35 | 30 |

| | |
|----|----|
| 49 | 70 |
| 60 | 20 |
| 43 | 30 |
| 37 | 50 |
| 43 | 72 |
| 49 | 60 |
| 10 | 45 |
| 20 | 25 |

- (b) In one sample of 8 observations, the sum of the squares of deviation of the sample values from the sample was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significance at 5% level. Given that 5% point of F for $n_1 = 7$ and $n_2 = 9$, degree of freedom is 3.29. 5

(Compulsory Question)

9. (a) An urn contains 5 white and 8 black balls. A set of three balls are drawn two times successively, such that the balls are not replaced before the second draw. Find the probability that the first draw gives 3 white balls and second draw gives 3 black balls. 2

- (b) Find the probability distribution of the number of heads, in three tosses of a coin. 2
- (c) A dice is thrown 6 times. Getting an odd number is a success. What is the probability of at least 5 successes and no success ? 2
- (d) If the sum of mean and variance of a binomial distribution is 4.8 for 5 trails. Find the distribution. 2
- (e) If a random variable x has a Poisson distribution s.t. $P(x = 1) = P(x = 2)$, then find $P(x = 4)$. 2
- (f) What do you mean by sampling ? 2
- (g) What do you mean by line of correlation ? 2
- (h) Define Chi-square test in terms of O and E. 2
- (i) What are the properties of point estimators ? 2
- (j) What is prediction interval ? 2