Roll No. Total Pages : 05

J-FB-22-00219

B.Tech. EXAMINATION, 2022

Semester III (CBCS)

PROBABILITY AND STATISTICS

MA-301

(Common for B.Tech. All Branches)

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. From a lot of 12 items containing 3 defective items, a sample of 4 items is drawn at random without replacement. Let a random variable X denote the number of defective items in the sample. Find the probability distribution of X. **10**

2. A random variable X has the following probability distribution :

X	P(X)
1	c
2	c
3	$3c$
4	$c^2 + c$
5	$6c^2$

Find :

(a) The value of c.

(b) Evaluate $P(X < 2)$, $P(0 < X < 3)$. **10**

Section B

3. Verify that the following is a distribution function : **10**

$$f(x) = \begin{cases} 0, & \text{for } x < 0 \\ \frac{x}{3}, & \text{for } 0 \le x < 1 \\ \frac{1}{3}, & \text{for } 1 \le x < 2 \\ \frac{x}{6}, & \text{for } 2 \le x < 6 \\ 1, & \text{for } x \ge 6 \end{cases}$$

4. In the book of 600 pages, there are 60 typographical errors. Assuming Poisson law for the number of error per page, find the probability that a randomly chosen 4 pages will contain no error. 16

Section C

5. The mean value of a random sample of 144 items is 75 with standard deviation 15. Find the 95% confidence limit for the population mean. Assume normal approximation to the sample. also find the minimum sample size to estimate the mean with in 4 units of the true mean at 95% confidence limit. **10**

6. Calculate standard error of the difference between standard deviation of two samples. **10**

Section D

7 Find the regression line from the following data : **10**

Age of Husband	Age of Wife
25	15
22	15
25	20
26	17

35	22
20	14
22	16
40	21
20	15

8. The values of two random samples are given below :

Sample 1	Sample 2
15	35
25	31
16	25
20	38
22	26
24	29
21	32
17	34
19	33
23	27
	29
	31

Can we conclude that the two samples are drawn from the same population ? Test at 5% level of significance. **10**

(Compulsory Question)

9. (a) The probability that the student A fails in an examination is 0.25 and the probability that the student B fails in the same examination is 0.3. Find the probability that either A or B fails in the examination. **5**

(b) An irregular six faced dice is thrown 12 times. The expectation that it will give six even numbers is twice the expectation that it will give 5 even numbers. If 1000 sets, each of exactly 12 trials are made, how many sets are expected not to give any even number ? **5**

(c) Define the following with *one* suitable example : **5**

(i) Maximum likelihood etimation

(ii) Prediction interval.

(d) Write a short note on *t*-test. **5**