

**END TERM EXAMINATION**

SIXTH SEMESTER [B.TECH] JUNE 2024

Paper Code: DA-304T

Subject: Statistics, Statistical Modelling &  
Data Analytics

Time: 3 Hours

Maximum Marks:75

Note: Attempt five questions in all including Q.No.1 which is compulsory.  
Select one question from each unit.

Q1 Attempt All [3x5=15]

- a) State Gauss-Markov theorem in detail.  
 b) Define open set and closed set. Also give examples.  
 c) State Cayley- Hamilton theorem and why it is useful.  
 d) A variate X has the probability distribution .

X	-3	6	9
P(X=x)	1/6	1/2	1/3

Find E(X) and E(X<sup>2</sup>). Hence evaluate Var(X).

- e) Two bolts are drawn from a box containing 6 good and 8 defective bolts. Find the probability that the second bolt is good if the first one is found to be defective.

**UNIT-I**

- Q2 a) A manufacturer knows that the condensers he makes, contain on an average 1% defective. He packs them in boxes of 100. What is the probability that a box selected at random will contain 3 or more defective condensers? (5)  
 b) Calculate the mean and standard deviation for the following: (5)

Size of item	6	7	8	9	10	11	12
Frequency	3	6	9	13	8	5	4

- c) A sample of 100 iron bars is said to be drawn from a large number of bars whose lengths are normally distributed with mean 4 feet and S.D. 0.6 feet? If the sample mean is 4.2 feet, can the sample be regarded as a truly random sample? (5)
- Q3 a) Define chi-square test as goodness of fit. A random number table of 250 digits showed the following distribution of digits 0,1,2,3,4,5,6,7,8,9.

Digit	0	1	2	3	4	5	6	7	8	9
Observed Frequency	17	31	29	18	14	20	35	30	20	36
Expected Frequency	25	25	25	25	25	25	25	25	25	25

Does the observed distribution differ significantly from expected distribution using a significance level of 0.01? Given that  $\chi^2_{0.01}$  for a degree of freedom is 21.7. (7.5)

- b) X is a normal variate with mean 30 and standard deviation is 5. Find the probability that: i)  $26 \leq X \leq 40$  ii)  $X \geq 45$  iii)  $|X-30| > 5$ .  
 (Given that  $P(0 \leq z \leq 1) = 0.3413$ ,  $P(0 \leq z \leq 2) = 0.4772$ ,  $P(0 \leq z \leq 0.8) = 0.2881$ ,  $P(0 \leq z \leq 3) = 0.4986$ ). (7.5)

P.T.O.