

Total No. of Questions : 8]

SEAT No. :

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[6261]-45

S.E. (Artificial Intelligence and Data Science)

STATISTICS

(2019 Pattern) (Semester - IV) (217528)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.
- 2) Figures to the right indicate full marks.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Make suitable assumption wherever necessary.

- Q1)** a) For the following distribution, find (1) first 4 moments about any arbitrary point (2) Four Central Moments. [9]

X	2	2.5	3	3.5	4	4.5	5
F	5	38	65	92	70	40	10

- b) The regression equations are  $8x - 10y + 66 = 0$  and  $40x - 18y = 214$ . The value of variance of  $x$  is 9. Find : [9]

- i) The mean values of  $x$  and  $y$ .
- ii) The correlation  $x$  and  $y$  and
- iii) The standard deviation of  $y$ .

OR

- Q2)** a) The first four moments about the working mean 30.2 of distribution are 0.255, 6.222, 30.211 and 400.25. Calculate the first four moments about the mean. Also evaluate  $\beta_1$ ,  $\beta_2$  and comment upon the skewness and kurtosis of the distribution. [9]

- b) Obtain the regression lines  $y$  on  $x$  and  $x$  on  $y$  for the data : [9]

$x$	5	1	10	3	9
$y$	10	11	5	10	6

P.T.O.

- Q3) a)** A Dice is thrown 10 times. If getting an odd number is a success. What is the probability of getting (i) 8 successes (ii) at least 6 success. [6]
- b)** If the probability that an individual suffers a bad reaction from certain injection is 0.001. Determine the probability out of 2000 people, by using Poisson's distribution (i) Exactly 3 (ii) More than 1 will suffer a bad reaction. [5]
- c)** For a normal distribution when mean = 2, standard deviation = 4, find the probabilities of the following intervals. [6]
- i)  $4.43 \leq x \leq 7.29$   
 ii)  $-0.43 \leq x \leq 5.39$
- [Given :  $A(z = 0.61) = 0.2291$ ,  $A(z = 1.32) = 0.4066$ ,  $A(z = 0.85) = 0.3023$ ]

OR

- Q4) a)** A Random variable X with following probability distribution [5]

X	0	1	2	3	4
P(X)	0.1	k	2k	2k	k

Find :

- i) k  
 ii)  $P(x < 2)$   
 iii)  $P(x \geq 3)$   
 iv)  $P(1 \leq x \leq 3)$
- b)** In a continuous distribution density function. [6]  
 $f(x) = kx(2 - x)$ ,  $0 < x < 2$   
 Find the value of  
 i) k  
 ii) Mean  
 iii) Variance
- c)** MNC company conducted 1000 candidates aptitude test. The average score is 45 and the standard deviation of score is 25. Assuming normal distribution for the result. [6]  
 Find :  
 i) The number of candidates whose score exceed 60.  
 ii) The number of candidates whose score lies between 30 & 60.  
 [Given :  $A(z = 0.6) = 0.2257$ ]

- Q5) a)** The table below gives the number of customers visit the certain company on various days of week. [6]

Days	Sun	Mon	Tue	Wed	Thurs	Fri	Sat
Number of Customers	6	4	9	7	8	10	12

Test at 5% of level of significance whether customer visits are uniformly distributed over the days.

[Given  $\chi^2_{6,0.05} = 15.592$ ]

- b) In a Batch of 500 articles, produced by a machine, 16 articles are found defective. After overhauling the machine, it is found that 3 articles are defective in a batch of 100. Has the machine improved? [6]

[Given  $Z_\alpha = 1.96$ ]

- c) In two independent samples of size 8 and 10, the sum of squares deviations of the sample values from the respective sample means were 84.4 and 102.6. Test whether the difference of variances of the population is significance or not. [6]

[Given  $F_{t,0.05} = 3.29$ ]

OR

- Q6) a)** In an experiment on pea breeding, the following frequencies of seeds were obtained. [6]

Round and Green	Wrinkled and Green	Round and Yellow	Wrinkled and Yellow	Total
222	120	32	150	524

Theory Predicts that the frequencies should be in Proportion 8:2:2:1. Examine the correspondence between theory and experiment.

[Given  $\chi^2_{3,0.05} = 7.815$ ]

- b) For sample I :  $n_1 = 1000, \Sigma x = 49000, \Sigma(x - \bar{x})^2 = 7,84,000$ ,

For sample II :  $n_2 = 1500, \Sigma x = 70500, \Sigma(x - \bar{x})^2 = 24,00,000$ .

Discuss the significance difference between mean score.

[Given  $Z_\alpha = 1.96$ ]

- c) Samples of size 10 and 14 were taken from two normal populations with standard deviation 3.5 and 5.2. The sample means were found to be 20.3 and 18.6. The whether the means of the two populations are at the same level. [6]

[Given  $t_{22,0.05} = 2.07$ ]

**Q7) a)** State & prove Neyman-Pearson Fundamental Lemma. [9]

b) Let  $P$  be the probability that a coin will fall head in a single toss in order to test  $H_0 : P = \frac{1}{2}$  against  $P = \frac{3}{4}$ . The coin is tossed 5 times and  $H_0$  is rejected if more than 3 heads are obtained. Find the probability of type I error and power of the test. [8]

OR

**Q8) a)** Show that the likelihood ratio test for testing the equality of variances of two normal distribution is the usual F-test. [9]

b) Write short note on : [8]

i) Population and sample

ii) Type I and Type II Error

iii) Critical Region

iv) Power of test

