Total No. of Questions: 8]

SEAT No. :

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[5925]-327

S.E. (Artificial Intelligence and Data Science)

STATISTICS

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

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Q.1 or Q.2 Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Assume suitable data, if necessary.*
4) *Figures to the right indicate full marks.*

Q1) a) Calculate: **[10]**

i) Quartile deviation (Q.D.),

ii) Mean Deviation (M.D.) from mean, for the following data:

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	6	5	8	15	7	6	8

b) The variables X and Y are connected by the equation $aX + bY + c = 0$. Show that the correlation between them is -1 if the signs of a and b are alike and +1 if they are different. **[8]**

OR

Q2) a) An alalysis of monthly wages paid to the workers of two firms A and B belonging to the same industry give the following results: **[10]**

	Firm A	Firm B
Number of workers	500	600
Average daily wage	Rs. 186.00	Rs. 175.00
Variance of distribution of wages	81	100

i) Which firm, A or B, has a larger wage bill?

ii) In which firm, A or B, is there greater variability in individual wages?

iii) Calculate (a) the average daily wage, and (b) the variance of the distrubution of wages of all the workers in the firm is A and B taken together.

P.T.O.

b) In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible: **[8]**
Variance of X=9. Regression equations: 8X–10Y+66=0, 40X–18Y=214.
what are:

i) the mean values X and Y ,
ii) the correlation coefficient between X and Y,
iii) the standard deviation of Y?

Q3) a) A Dice is thrown 10 times. If getting an odd number is a sucess. What is the probability of getting **[5]**

i) 8 successes
ii) at least 6 success?

b) Fit Poisson's distribution to following data and calculate theoretical frequencies. **[6]**

x	0	1	2	3	4
f	122	60	15	2	1

c) In a Sample of 1000 caes the means of a certain test is 14 and standard deviation is 2.5 assuming the distrubution to be normal find **[6]**

i) How many students scored between 12 & 15.
ii) How many scored below 8.

[Given: $A(z=0.8)=0.2881$), $A(z=0.4)=0.1554$), $A(z=2.4)=0.4918$]

OR

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

X	1	2	3	4	5	6	7
$P(X)$	k	$2k$	$3k$	k^2	k^2+k	$2k^2$	$4k^2$

Find.

i) k
ii) $P(x>5)$
iii) $P(1\le x\le 5)$

b) In a continuous distribution density function **[6]**

$f(x)=kx^2(1-x^3), 0\le x\le 1.$

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 candidate whose score exceed 60.

ii) The number of candidates whose score lies between 30 & 60.

[Given: A(Z = 0.6) = 0.2257)]

Q5) a) In an experiment of pea breeding the following frequencies of seeds were obtained. [6]

Round and green	Wrinkle and green	Round and yellow	wrinkle and yellow	Total
222	120	32	150	524

Theory predicts that the frequencies should be in the proportion 8:2:2:1. Examine the correspondence between theory and experiment. Given chi-square $(0.05,3) = 7.815$

b) The average marks in mathematics of a sample of 100 students was 51 with standard deviation of 6 marks. Could this have a random sample from the population with average marks 50? Given Zα at 5% level of significance = 1.96 [6]

c) A random sample of 16 newcomers gave a mean of 1.67 m and standard deviation of 0.16 m. Is the mean height of newcomers significantly different from the mena height of students' population of the previous year? Given $t_{0.05,\ 15} = 2.13$ [6]

OR

Q6) a) Following table shows number of books issued on the various days of week from a certain library At 5% level of significance test the null hypothesis that number of books issued in department of the day. [6]

Day	Mon.	Tue.	Wed.	Thurs.	Fri.	Sat.
No. of books issued	120	130	110	115	135	140

Given: Chi-square value at 5% level of significance for degrees of freedom 5 is 11.071.

b) A random sample of 900 members has mean 3.4 cms. Can it be reasonable regarded as a sample from a large population of mean 3.2 cms and standard deviation 2.3 cms. [6]

c) Find the F-statistics form the following data: [6]

Sample	size (n)	Total observation Σx	Sum of squares of observations
1	8	9.6	61.52
2	11	16.5	73.26

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

b) Given the frequency function [8]

$$f(x,\theta) = \frac{1}{\theta}, 0 \le x \le \theta$$

$= 0$; elsewhere

And that you are testing the null hypothesis $H_0 : \theta = 1$ *vs* $\theta = 2$ by means of a single observed value of x. what would be the size of Type I and Type II error. If you choose the interval

i) $0.5 \le x$

ii) $1 \le x \le 1.5$

Also obtain the power function of the test.

OR

Q8) a) Write short notes on [8]

i) Most powerful test

ii) Uniformly most powerful test

iii) Advantages and disadvantages of non-parametric tests

iv) Level of significance

b) Explain in detail about test for the Equality of means of serveral normal populations. [9]