Total No. of Questions : 8]

SEAT No. :

P9119

[Total No. of Pages : 4

[6179]-245
S.E. (Artificial Intelligence & Data Science Engineering)
STATISTICS
(2019 Pattern) (Semester - IV) (217528)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Make suitable assumption whenever necessary.***

Q1) a) The first four moments of a distribution about the value 5 are 2,20,40 and 50. From the given information obtain the first four central moments, coefficient of skewness and kurtosis. **[6]**

b) Obtain the regression lines y on x and x on y for the data. **[6]**

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

c) Calculate standard deviation for the following frequency distribution. Decide whether Arithmetic mean is good or not. **[6]**

Wages in rupees earned per day	0-10	10-20	20-30	30-40	40-50	50-60
No. of laborer's	5	9	15	12	10	3

OR

Q2) a) Following are the values of import of raw material and export of finished product in suitable units.

Export	10	11	14	14	20	22	16	12	15	13
Import	12	14	15	16	21	26	21	15	16	14

Calculate the coefficient of Correlation between the import values and export values. **[6]**

b) If the two lines of regression are $9x + y - \lambda = 0$ and $4x + y = \mu$ and the means of x and y are 2 and -3 respectively, find the values of λ, μ and the coefficient of correlation between x and y. **[6]**

P.T.O.

c) Compute the first four moments about arbitrary mean A = 25 for the following frequencies. **[6]**

No of Jobs	0-10	10-20	20-30	30-40	40-50
No of Workers	6	26	47	15	6

Q3) a) 20% of bolts produced by a machine are defective. Determine the probability that out of 4 bolts chosen at a random. **[5]**

i) 1 is defective

ii) Zero are defective

iii) At most 2 bolts are defective

b) The average number of misprints per page of a book 1.5. Assuming the distribution of number of misprints to be Poisson, Find **[6]**

i) The Probability that a particular book is free from misprints.

ii) Number of pages containing more than one misprint if the book contains 900 pages.

c) For a normal distribution When mean = 2, standard deviation $\sigma = 4$, 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) Fit a Poisson Distribution to the following data and calculate theoretical frequencies **[6]**

x	0	1	2	3	4	Total
f	109	65	22	3	1	200

c) The lifetime of an article has a normal distribution with mean 400 hours and standard deviation 50 hours. Find the expected number of articles out of 2000 whose lifetime lies between 335 hours to 465 hours. **[6]**

(Given : A(z = 1.3) = 0.4032)

Q5) a) The Table below gives the number of customers visit the certain company on various days of week

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

Test at 5% of level of significance whether customer visits are uniformaly distributed over the days. **[6]**

[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) 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. Test whether the means of the two populations are at the same level. **[6]**

(Given $t_{0.05,22} = 2.07$)

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 Yeallow	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, Σx = 49000, $\Sigma(x - \bar{x})^2$ = 7,84,000,

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

Discuss the significant difference between mean score. **[6]**

(Given Z_α = 1.96)

c) Find the F statistics from the following data: **[6]**

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

Q7) a) 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]**

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

OR

Q8) a) Write short notes on **[8]**

i) Most Powerful test

ii) Level of significance

iii) Advantages and disadvantages of non-parametric test

b) State and Prove Neyman - Pearson lemma for testing a simple hypothesis against a simple alternative hypothesis. **[9]**

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