Total No. of Questions : 8]

SEAT No. :

PE-4273

[Total No. of Pages : 4

[6582]-45
S.E. (Artificial Intelligence & 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.7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of Calculator is allowed.***

Q1) a) Calculate Mean and standard deviation from the following data. **[9]**

Marks obtained	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
No. of Students	2	5	7	13	21	16	8	3

b) Calculate the coefficient of correlation for the ages of husbands and wives **[9]**

Ages of Husband (Years)	23	27	28	29	30	31	33	35	36	39
Ages of Wife (Years)	18	22	23	24	25	26	28	29	30	32

OR

Q2) a) Determine the equation of regression lines for the following data. Also find the value of **[9]**

i) y for $x = 12$

ii) x for $y = 8$

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

b) The first four moments of a distribution at x = 2 are 1, 2.5, 5.5 & 16 then **[9]**

i) Calculate the first central moments

ii) Find mean and standard deviation

iii) Find the coefficient of skewness and kurtosis

P.T.O.

Q3) a) Out of 2000 families with 4 children each how many would expect to have **[6]**

i) at least a boy

ii) Two boys

iii) No girls

b) Fit a Poisson's 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) In a certain company install 2000 LED bulbs on each floor. If LED bulbs have average life of 1000 burning hours with standard deviation of 200 hours using normal distribution find what number of LED bulbs might to expected to fail in 700 hours **[5]**

(Given $p(0 < z < 1.5) = 0.4332$)

OR

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

X	-2	-1	0	1	2	3
P(X)	0.1	K	0.2	2K	0.3	3K

Find

i) k

ii) P(X<2)

iii) P(-2<X<2)

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

$$f(x) = \begin{cases} kx^2(1-x^3) & 0 \le x \le 1 \\ 0 & otherwise \end{cases}$$

Then find value of

i) k

ii) Mean

c) For a normal distribution when mean = 1, standard deviation = 4, find the probabilities of the following intervals : **[6]**

i) $4.43 \le x \le 7.29$

ii) $-0.43 \le x \le 5.39$

[Given: $A(z = 0.61) = 0.2291, A(z = 1.32) = 0.4066, A(z = 0.85) = 0.3023$]

Q5) a) A set of five similar coins is tossed 210 times and the result is given in the following table. **[6]**

No.of heads	0	1	2	3	4	5
frequency	2	5	20	60	100	31

Use chi-square test to test the hypothesis that data follows a binomial distribution

(chi-square = 11.07 at 5% level of significance)

b) The height of college students in the city are normally distributed with S.D. 6 cms. A sample of 1000 students has mean height 158 cms test the hypothesis mean height of college students in the city is 160 cms? **[6]**

(Given $Z_\alpha = 1.96$ at 5% level of significance)

c) The following table gives the number of units produced per day by 2 workers A and B for some days can we say that worker A is more stable than worker B? **[6]**

Worker A	40	30	38	41	38	35		
Worker B	39	38	41	33	32	49	49	34

[Given $F_{0.05} = 4.88$ at degree of freedom (7,5)]

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	120	130	110	115	135	110

Given: Chi-square =11.071 at 5% level of significance for degrees of freedom 5

b) Before increasing the excise duty it is observed that out of a sample 1000 persons 800 were coffee drinkers After an increase in the duty out of 1200 persons, 800 were found to be coffee drinkers. Is there a significance decrease in coffee consumption after increasing the excise duty **[6]**

(Given $Z_\alpha = 1.96$ at 5% level of significance)

c) Sample of size 10 and 14 were taken from two normal population 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 two population are at the means of two population are at the same level? **[6]**

Given $t_{0.05,\ 22} = 2.07$

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 $H_0 : P = \frac{1}{2}$ Vs. $H_1 : P = \frac{3}{4}$ The coin is toss 5 times and H_0 is rejected if more than 3 heads are obtained. Find the probabilities of Type I and Type II error. **[8]**

OR

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

i) Critical region

ii) Type I and Type II error

iii) Level of significance θ

iv) Most powerful test

b) If $x \geq 1$ is the critical region for testing H_0: $\theta = 2$ against the alternative H_1: $\theta = 1$ on the basis of the single observation from the population. $f(x,\theta) = \theta\, e^{-\theta x}$, $0 \leq x < \infty$, obtain the values of type I, type II error and also find power of function of the test. **[9]**

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