THAKUR COLLEGE OF ENGINEERING AND TECHNOLOGY

S. E. SEMESTER IV (CBCGS-HME 2020) MARCH 2022

Subject: Statistical Decision Making | Branch: AIML

Q.P. Code: B-46001 | Total Marks: 60

(Time : 2 hours)

Instructions: 1. All Sections are compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if necessary and state the assumptions clearly.

Section-I (08 Marks)		
Q. No.	Multiple choice question (Answer any 08 questions out of 10)	Marks
1	Population value is called- (i) Parameter (ii) Statistics (iii) Variable (iv) data	1
2	Which of the following is not a non-probability sampling? (i) Judgmental Sampling (ii) Convenience sampling (iii) Quota sampling (iv) Cluster sampling	1
3	Which of these distribution is used for testing of hypothesis? (i) Normal distribution (ii) Chi-square distribution (iii) Gamma distribution (iv) Poisson distribution	1
4	Which of the following statement is true about the type II error? (i) Type two error means to accept an incorrect alternative hypothesis (ii) Type two error means to reject an incorrect alternate hypothesis. (iii) Type two error means to accept a correct alternate hypothesis. (iv) Type two error means to reject a correct alternate hypothesis.	1
5	A t-test is a significance test that assesses (i) The means of two independent groups. (ii) The medians of two dependent groups. (iii) The modes of two independent groups. (iv) The standard deviation of 3 independent variables.	1
6	Which of the following statement is true about the regression line? (i) A regression line is also known as line of average relationship. (ii) A regression line is also known as line of estimating variables.	1

	(iii) A regression line is also known as line of predicting equation. (iv) All of the above.	
7	Which of the following is true for the coefficient of correlation? (i) The coefficient of correlation is not dependent on the change of scale. (ii) The coefficient of correlation is not dependent on the change of origin. (iii) The coefficient of correlation is not dependent on both the change of scale and change of origin (iv) None of the above.	1
8	The meaning of least squares method guarantees that- (i) The square is the least value regardless of what shape is used to model the data. (ii) There is the least amount of squared values in the forecasting equation. (iii) The sum of all squared values of deviations of the trend from the actual values is minimum. (iv) The output of equation when squared should give the least amount.	1
9	The level of significance can be viewed as the amount of risk that an analyst will accept when making a decision. (i) Statement is true (ii) Statement is false. (iii) Statement is neither true nor false. (iv) Statement is not satisfactory.	1
10	Given below is a summary of ANOVA for four groups of students tested in a research project:	1

Source of Variance	Sum of Squares	Degree of freedom	Mean sum of Squares
Between groups	76	3	23.33
Within groups	122	16	7.62

What will be the value of F- test ratio for above data?

(i) 76/122 (ii) 3/16 (iii) 23.33/7.62 (iv) 7.62/23.33

Section-II (12 Marks)		
	Objective questions(Answer any 4)	
1	Calculate the correlation coefficient with the help of following data using Karl	3

	Pearson's coefficient of correlation method. $\sum x = 65, \sum y = 125, \sum (x - \bar{x})^2 = 160,$ $\sum (y - \bar{y})^2 = 358, \sum (x - \bar{x})(y - \bar{y}) = 236$	
2	Many casinos use card-dealing machines to deal cards at random. Occasionally, the machine is tested to ensure an equal likelihood of dealing for each suit. To conduct the test 1500 cards are dealt from the machine and following results were observed: Calculate $\chi^2_{calculate}$ from the above data.	3
3	An ambulance service claims that it takes on an average 8.9 minutes to reach its destination in emergency calls. To check on this claim, the agency which license ambulance service has then timed on 50 emergency calls, getting a mean of 9.3 minutes with standard deviation of 1.6 minutes. To get the conclusion over it calculate Z value.	3
4	A sample of 8 pens from a normal population was taken. It was found that sum of the squares of deviations from the mean is 84.4 and for another sample of 10 pens is 102.6. Calculate F- test ratio from the data.	3
5	By the method of least square, find the straight line $y = a + bx$ that best fits the following data:	3
6	The average height of a random sample of 400 people from a city is 1.75 m. It is known that weights of the population are random variables that follow a normal distribution with a standard deviation of 0.16. Determine the 95% confidence interval for the average height of population. (Given $z_\alpha = 1.96$)	3

Spades	Diamonds	Clubs	Hearts
Observed	402	358	273	467
Expected	375	375	375	375

X	1	2	3	4	5
Y	14	27	40	55	68

Section-III (20 Marks)

	Short Answer question(Answer any 04)	
1	A random sample of 10 laptops had following stand by time (in minutes): Do these data support the assumption of a population mean of stand by time is 100 minute? (Given $t_{table\ value}$=2.26)	5
2	On the basis of information given below about the treatment of 200 patients suffering from heart disease, state whether the new treatment is comparatively superior to the conventional treatment. (given $\chi^2_{table\ value} = 3.841$)	5

70	120	101	88	95	107	100	110	83	98

	Treatment	Favorable	Not Favorable	Total	
	New	60	30	90	
	Conventional	40	70	110	
	Total	100	100	200	

3 Ten students got the following percentage of marks in mathematics and physics: — **5**

Maths (x)	8	36	98	25	75	82	92	62	65	35
Physics (y)	84	51	91	60	68	62	86	58	35	49

Find the rank correlation coefficient.

4 Find the regression coefficient b_{yx} and b_{xy} and hence find the correlation coefficient between x and y for the following data: — **5**

X	4	2	3	4	2
Y	2	3	2	4	4

5 In a sample of 1,000 people in Maharashtra, 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in this state at 1% level of significance? (Take $z_{\alpha} = 2.58$) — **5**

6 For the data given below, find the equation to the best fitting exponential curve of the form $y = ae^{bx}$. — **5**

X	1	2	3	4	5	6
Y	1.6	4.5	13.8	40.2	125	300

Section-IV (20 Marks)

Long Answer question (answer any 2)

1 Obtain a relation of the form $y = ax^b$ for the following data by the method of least squares. — **10**

X	1	2	3	4	5	6
Y	2.98	4.26	5.21	6.1	6.8	7.5

2 The average hourly wage of a sample of 150 workers in a plant 'A' was Rs 2.56 with a standard deviation of Rs 1.08. The average hourly wage of a sample of 200 workers in plant 'B' was Rs 2.87 with a standard deviation of Rs 1.28. Can an applicant safely assume that the hourly wages paid by plant B are higher than those paid by plant A? (Given $z_{\alpha} = -1.645$) — **10**

3 The table below shows the lifetime of toy car brands under controlled conditions, in hours in excess of 100 hours, of three different brands — **10**

Brand 1	16	15	13	21	15
Brand 2	18	22	20	16	24
Brand 3	26	31	24	30	24

Construct the analysis of variance table from the above data. (Given $F_{0.05}(2,12)=3.89$)

80
100
135.