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DEPARTMENT OF MATHEMATICS

QUESTION BANK

I SEMESTER

1918108 – STATISTICS FOR MANAGEMENT

Regulation – 2019

Academic Year 2019 - 2020

Prepared by

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DEPARTMENT OF MATHEMATICS

QUESTION BANK

SUBJECT : **1918108 – STATISTICS FOR MANAGEMENT**

SEM / YEAR : **I Semester / I Year**

UNIT I - INTRODUCTION

SYLLABUS: Basic definitions and rules for probability, conditional probability independence of events, Baye's theorem, and random variables, Probability distributions: Binomial, Poisson, Uniform and Normal distributions.

PART- A

S.NO	QUESTIONS	BT Level	COMPETENCE
	PART – A		
1.	Define Statistics.	**BTL -6**	Creating
2.	What is the addition and multiplication theorem on probability.	**BTL -1**	Remembering
3.	Distinguish between a priori and posterior probability?.	**BTL -6**	Creating
4.	The price of the selected stock over a five day period shown as 170, 110, 130, 170 and 160. Compute mean , median and mode.	**BTL -6**	Creating
5.	A car travels 25 miles at 25 mph, 25 miles at 50 mph and 25 miles at 75 mph. Find the harmonic of three velocities?	**BTL -4**	Analyse
6.	A ball is drawn at random from a box containg 6 red balls, 4 white balls and 5 blue balls. Find the probability that the ball drawn is not red.	**BTL -4**	Analyse
7.	Find the median and mode for the weights (kgs) of 15 persons given as 68, 85, 70, 65, 71, 67, 65, 55, 80, 62, 65, 64, 70, 60, 56.	**BTL -3**	Applying
8.	Name few measures of dispersion.	**BTL -1**	Remembering
9.	write the common measures of central tendency?	**BTL -1**	Remembering
10.	Define continuous and discrete variables examples.	**BTL -1**	Remembering
11.	Let X be the lifetime in years of a mechanical part. Assume that X has the cdf $F(x) = 1- e^{-x}$, $x \geq 0$. Find $P[1< X \leq 3]$.	**BTL -1**	Remembering
12.	Define independent events.	**BTL -1**	Remembering
13.	State the theorem of total probability	**BTL -1**	Remembering
14.	What is the use of Baye's theorem?	**BTL -6**	Creating
15.	Mention the properties of a discrete probability distribution.	**BTL -1**	Remembering
16.	Define a Poisson distribution and mention its mean and variance.	**BTL -1**	Remembering
17.	If the mean and variance of a binomial distribution are respectively 6	**BTL -3**	Applying

	and 2.4, find P(x=2).		
18.	If x is a Poisson distribution such that P(x=1)=4P(x=2). Find its mean and variance.	**BTL -3**	Applying
19.	Suppose that X has a Poisson distribution with parameter $\lambda = 2$. Compute $P[X \geq 1]$.	**BTL -1**	Remembering
20.	Define mutually exclusive events.	**BTL -1**	Remembering

PART-B

1(a).	Calculate the mean and standard deviation for the following table giving the age distribution of 542 members. Age: 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 No: 3 | 61 | 132 | 153 | 140 | 51 | 2	**BTL-2**	Understanding
1(b).	Find the geometric mean for the following data: Group: 2-4 | 4-6 | 6-8 | 8-10 Frequency: 200 | 400 | 300 | 100	**BTL-2**	Understanding
2(a).	Find the mean, median and modal ages of married women at first child birth Age at the birth of first child: 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 No of married women: 37 | 162 | 343 | 390 | 256 | 433 | 161 | 355 | 65 | 85 | 49 | 46 | 40	**BTL -6**	Creating
2(b).	If A and B are independent event with P(A)=2/5, and P(B)=3/5, find P(A∪B). Let S= {1,2,3,4,5,6} if A = {2,4,6} then find the probability of A complement.	**BTL -3**	Applying
3(a).	Given: The probabilities of three events A, B and C occurring are P(A) = 0.35, P(B) = 0.45 and P(C) = 0.2. Assuming that A, B, or C has occurred, the probabilities of another event X occurring are P(X/A) = 0.8, P(X/B) = 0.65 and P(X/C) = 0.3. Find P(A/X), P(B/X) and P(C/X).	**BTL -6**	Creating
3(b).	4 cards are drawn from a well shuffled pack of cards. Find the probability that (i) All the four are queens (ii) There is one card from each suit. (iii) Two cards are diamonds and two are spades All the four cards are hearts and one of them is jack	**BTL -6**	Creating
4(a).	Three machines all turn out non ferrous castings. Machine A produces 1% defective and Machine B- 2% and machine C – 5%. Each machine produces 1/3 of the output. An inspector examines a single casting, which he determines as non defective. Estimate the probabilities of its having been produced by each machine.	**BTL -6**	Creating
4(b).	If the random variable X takes values 1, 2, 3, 4 such that 2P(X = 1) = 3P(X = 2) = P(X=3) = 5P(X = 4), find the probability distribution and cumulative distribution of X.	**BTL-2**	Understanding
5(a).	Two dice are thrown together once. Find the probabilities for	**BTL -3**	Applying

	getting the sum of the two numbers (i) equal to 5, (ii) multiple of 3, (iii) divisible by 4.		
5(b).	Given $\lambda = 4.2$, for a poisson distribution. Find (a) $P(X \leq 2)$ (b) $P(X \geq 5)$ (c) $P(X = 8)$.	BTL -6	Creating
6(a).	An urn contains 5 balls. Two balls are drawn and found to be white. What is the probability that all the balls are white?	**BTL-1**	Remembering
6(b).	The contents of urns I, II, III are as follows: 1 white, 2 black and 3 red balls; 2 white, 1 black and 1 red balls; 4 white, 5 black and 3 red balls; One urn is chosen at random and two balls drawn. They happen to be white and red. What is the probability that they come from urns I, II, III?	**BTL -3**	Applying
7(a).	In 1989, there were three candidates for the position of principal Mr. Chatterji, Mr. Ayangar and Dr. Singh. Whose chances of getting the appointment are in the proportion 4:2:3 respectively. The probability that Mr. Chatterji is selected, would introduce co-education in the is 0.3. The probabilities of Mr. Ayangar and Dr. Singh doing the same are respectively 0.5 and .08. What is the probability that there was co-education in the in 1990?	**BTL -3**	Applying
7(b).	Find the probability that atmost 5 defective bolts will be found in a box of 200 bolts, if it is known that 2% of such bolts are expected to be defective. ($e^{-4} = 0.0183$)	**BTL -6**	Creating
8(a).	A coin is tossed 6 times what is the probability of obtaining (a) 4 heads (b) 5 heads (c) 6 heads (d) getting 4 or more heads.	**BTL -3**	Applying
8(b).	In a bolt factory machines A, B, C manufacture respectively 25%, 35% and 40% of the total of their output 5, 4, 2 percent are defective bolts. If A bolt is drawn at random from the product and is found to be defective, what are the probabilities that is was manufactured by machines A, B and C?	**BTL -6**	Creating
9(a).	In a test of 2000 electric blubs it was found that the life of a particular make was normally distributed with an average life of 2040 hours and S. D. of 60 hours. Estimate the number of blubs likely to burn for (1) More than 2150 hours (2) Less than 1950 hours (3) More than 1920 hours but less than 2160 hours.	**BTL -3**	Applying
9(b).	The latest nationwide political poll indicates that for Americans who are randomly selected, the probability that they are conservative is 0.55, the probability that they are liberal is 0.30 and the probability that they are middle of the road is 0.15. Assuming these probabilities are accurate, answer the following	**BTL -4**	Analyzing

<table>
<tr><td></td><td>questions from a randomly chosen group of 10 Americans
(a) What the probability that 4 are liberal?
(b) What the probability that none are conservative
(c) What the probability that two are middle of the road
(d) What the probability that a least 8 are liberal</td><td></td><td></td></tr>
<tr><td>10.</td><td>If X follows a normal distribution with mean 12 and variance 16 cm, find the probabilities for (i) $X \leq 20$ (ii) $X \geq 20$, and (iii) $0 \leq X \leq 12$.</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>11.</td><td>A discerete random variable X has the probability function given below:
Value of X=x: 0 1 2 3 4 5 6 7
P(X=x) : 0 k 2k 2k 3k k^2 $2k^2$ $7k^2+k$
Find (1) The value of k
(2) P(1.5 < X < 4.5 / X > 2)
(3) P(X < 6), P(X ≥ 5), P(0 < X < 4)
(4) The distribution of X.</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>12.</td><td>X is a normal variable with mean 30 and standard deviation of 5. Find (i) P[26 ≤ X ≤ 40] (ii) P [X≥45] (iii) P [|X - 30|> 5] use normal distribution tables</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>13.</td><td>In an intelligence test administered on 1000 students, the average was 42 and standard deviation 24, find (i) the number of students exceeding a score 50. (ii) the number of students lying between 30 and 54(iii) the value of score exceeded by top 100 students.</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>14(a).</td><td>The probability that an entering student will graduate is 0.4 Determine the probability that out of 5 students atleast one will graduate.</td><td>BTL-5</td><td>Evaluating</td></tr>
<tr><td>14(b).</td><td>Fit a Poisson Distribution to the following data which gives the number of doddens in a sample of clover seeds
<table>
<tr><td>No</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr>
<tr><td>f</td><td>56</td><td>156</td><td>132</td><td>92</td><td>37</td><td>22</td><td>4</td><td>0</td><td>1</td></tr>
</table>
.</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td></td><td colspan="2">PART-C</td><td></td></tr>
<tr><td>1(a).</td><td>A disciplinary committee is formed from the staff of XYZ Company which has three departments Marketing, Finance and Production of the 10,5,20 members respectively. All departments have two female staff each. A department is selected at random and from which two matters are selected for the committee,
What is the probability that both the team members are female?</td><td>BTL-6</td><td>Creating</td></tr>
</table>

1(b).	In a bolt factory machines A, B, C manufacture respectively 25, 35 and 40 percent of the total. Of their output 5, 4 and 2 percent are defective bolts respectively. A bolt is drawn at random from the product and is found o be defective. What are the probabilities that it was manufactured by machines A, B or C?	**BTL-2**	Understanding
2(a).	State Bayes theorem and brief about its applications.	**BTL-2**	Understanding
2(b).	Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls (ii) at least 1 boy (iii) at most 2 girls (iv) children of both sexes? Assume equal probabilities for boys and girls.	**BTL-1**	Remembering
3.	Describe the classifications of probability ?	**BTL-1**	Remembering
4.	What are the applications of Normal distribution in statistics?	**BTL-6**	Creating

UNIT –II- SAMPLING DISTRIBUTION & ESTIMATION.

SYLLABUS: Introduction to sampling distributions, sampling distribution of mean and proportion, application of central limit theorem, sampling techniques. Estimation: Point and Interval estimates for population parameters of large sample and small samples, determining the sample size.

PART - A

S.NO	QUESTIONS	BT Level	COMPETENCE
1.	Define Sampling distribution of proportion.	**BTL -1**	Remembering
2.	Define Probable standard error.	**BTL -1**	Remembering
3.	Define standard error and mention its importance	**BTL -1**	Remembering
4.	Define central limit theorem	**BTL -1**	Remembering
5.	What is the role of central limit theorem in estimation and testing problems	**BTL -6**	Creating
6.	Define stratified sampling technique	**BTL -1**	Remembering
7.	Briefly describe the significance level.	**BTL -1**	Remembering
8.	Distinguish between parameter and statistic.	**BTL -2**	Understanding
9.	Define estimator, estimate and estimation.	**BTL -1**	Remembering
10.	Distinguish between point estimation and interval estimation	**BTL -2**	Understanding
11.	Mention the properties of a good estimator.	**BTL -1**	Remembering
12.	Define confidence coefficient.	**BTL -1**	Remembering
13.	What is the level of significance in testing of hypothesis	**BTL -6**	Creating
14.	Define confidence limits for a parameter	**BTL -1**	Remembering
15.	State the conditions under which a binomial distribution becomes a normal distribution	**BTL -4**	Analyzing
16.	If the random sample comes from a normal population, what can be said about the sampling distribution of the mean.	**BTL -5**	Evaluating
17.	An automobile repair shop has taken a random sample of 40 services that the average service time on an automobile is 130 minutes with a standard deviation of 26 minutes. Compute the standard error of the mean.	**BTL -6**	Creating

18.	What is a random number? How it is useful in sampling?	**BTL -6**	Creating
19.	A population has the numbers: 12, 8, 10, 30, 12, 16, 40, 5, 16, 24, 22, 31, 30, 16, 15. Draw a systematic sample of size 5. Find out its mean.	**BTL -3**	Applying
20.	How large sample is useful in estimation and testing	**BTL -4**	Analyzing
	PART -B		
1(a).	A random sample of 700 units from a large consignment showed that 200 were damaged. Find (i) 95% (ii) 99% confidence limits for the proportion of damaged units in the consignment.	**BTL -3**	Applying
1(b).	A random sample of size 9 is obtained from a Normal population with mean 25 and if the variance 100 find the probability that the sample mean exceeds 31.2.	**BTL -4**	Analyzing
2(a).	In a normally distributed population, average income per household is Rs.20,000 with a standard deviation of Rs. 1,600. Find the probability that the sample mean will be between Rs.19,600 and Rs.20,200 in a survey of a random sample of 100 households.	**BTL -6**	Creating
2(b).	A university wants to determine the percentage of students who would accept proposed fees hike for improving facilities. The university wants to be 90% confident that the percentage is within2% of the true value. Find the sample size to achieve the accuracy regardless of the true percentage assuming the percentage of students accepting the increase in tuition fees to be 0.5.	**BTL -6**	Creating
3(a).	A bank has kept records of the checking balances of its customers and determined that the average daily balances of its customers is Rs.300 with a standard deviation of Rs. 48. A random sample of 144 checking accounts is selected. (i) What is the probability that the sample mean will be more than Rs. 306.60? (ii) What is the probability that the sample mean will be less than Rs. 308?	**BTL -6**	Creating
3(b).	From the question 3(a) (i) What is probability that the sample mean will between Rs. 302 and Rs. 308? (ii) What is probability that the sample mean will be atleast Rs. 296?	**BTL -6**	Creating
4(a).	Explain Stratified sampling technique and discuss how it is better than simple random sampling in a particular situation.	**BTL -4**	Analyzing
4(b).	Discuss the standard error of proportion	**BTL-2**	Understanding
5.	Explain the methods of drawing simple random sample from a finite population.	**BTL -4**	Analyzing

6(a).	In a sample of 1000 citizens of India, 540 are wheat eaters and the rest are rice eaters. Can we assume that both rice and wheat equally popular in India at 1 % level of significance?	**BTL-5**	Evaluating
6(b).	A simple random sample of 144 items resulted in a sample mean of 1257.85 and standard deviation of 480. Develop a 95% confidence interval for the population mean	**BTL -6**	Creating
7(a).	A car dealer wants to estimate the proportion of customers who still own the cars they purchased 5 years earlier. A random sample of 500 customers selected from the dealer's records indicate that 315 customers still own cars that they were purchased 5 years earlier. Set up 95% confidence interval estimation of the population proportion of all the customers who still own the cars 5 years after they were purchased.	**BTL-2**	Understanding
7(b).	A movie maker sampled 55 fans who viewed his master piece movie and asked them whether they had planned to see it again. Only 10 of them believed that the movie was worthy of a second look. Find the standard error of the population of fans who will view the film a second time. Construct a 90% confidence interval for this population.	**BTL -5**	Evaluating
8(a).	From a population of size 600, a sample of 60 individuals revealed mean and standard deviation as 6.2 and 1.45 respectively. (i) Find the estimated standard error (ii) Construct 96% confidence interval for the mean.	**BTL -3**	Applying
8(b).	The age of employees in a company follows normal distribution with its mean and variance as 40 years and 121 years respectively. If a random sample of 36 employees is taken from a finite normal population of size 1000, what is the probability that the sample mean is (i) less than 45 (ii) greater than 42 and (iii) between 40 and 42?	**BTL -6**	Creating
9(a).	A firm wishes to estimate with an error of not more than 0.03 and a level of confidence of 98%, the proportion of consumers that prefer its brand of household detergent. Sales report indicate the about 0.20 of all consumers prefer the firm's brand. What is the requisite sample size?	**BTL -5**	Evaluating
9(b).	A random sample of 700 units from a large consignment should that 200 were damaged. Find (i) 95% (ii) 99% confidence limits for the proportion of damaged units in the consignment	**BTL -3**	Applying
10(a).	From a population of 500 items with a mean of 100 gms and standard deviation of 12.5 gms, 65 items were chosen. (i) What is the standard error? (ii) Find P($99.5 < \bar{x} < 101.5$).	**BTL -6**	Creating
10(b).	A non-normal distribution representing the number of trips	**BTL -6**	Creating

<table>
<tr><td></td><td>performed by lorries per week in a coal field has a mean of 100 trips and variance of 121 trips. A random sample of 36 lorries is taken from the non-normal population. What is the probability that the sample mean is
(i) greater than 105
(ii) less than 102
(iii) between 101 and 103 trips?</td><td></td><td></td></tr>
<tr><td>11.</td><td>Test the significance of the difference between the means of the sample from the following data
<table>
<tr><td></td><td>Size of sample</td><td>Mean</td><td>SD</td></tr>
<tr><td>Sample A</td><td>100</td><td>61</td><td>4</td></tr>
<tr><td>Sample B</td><td>200</td><td>63</td><td>6</td></tr>
</table></td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>12(a).</td><td>A cigarete manufacturing firm claims that its brand. A outsells brand B by 8%. If it is found that 42 out of a sample of 200 smokers prefer brand a and 18 out of another sample of 100 smokers prefer brand B, test whether the 8% difference is a valid claim(use 5% level of significance).</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>12(b).</td><td>In an automotive safety test conducted by the North Carolina Highway Safety Research center, the average tyre pressure in a sample of 62 tyres was found to be 24 pounds per square inch, and the standard deviation was 2.1 pounds per square inch.
(i) What is the estimated population standard deviation for this population
(ii) Calculate the estimated standard error of the mean
(iii) Construct a 95% confidence interval for the population mean.</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>13(a).</td><td>The manager of a shop selling beverages wants to estimate the actual amount of beverages in one litre bottles from a nationally known manufacturer. As per manufacturer’s specifications, the standard deviation of the volume of the beverage is 0.02 litre. The average amount of beverage per 1 litre bottle is found to be 0.995 litre on checking 50 bottles. Setup 99% confidence interval estimate of the true population average amount of beverage in a 1 liter bottle. Check whether the manufacturer is genuine in filling the beverage.</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>13(b).</td><td>In a batch chemical process used for etching printed circuit boards, two different catalysts are being compared to determine whether they require different emersion times for removal of identical quantities of photo resist material. Twelve batch were run with catalyst 1, resulting in a sample mean emersion time of 24.6 minutes and sample standard deviation of 0.85 minutes. Fifteen batches were run with catalyst 2, resulting in a mean emersion time of 22.1 minutes and a standard deviation of 0.98 minutes. Find a 95% confidence interval on the difference in means, assuming that $\sigma_1^2 = \sigma_2^2$.</td><td>BTL -3</td><td>Applying</td></tr>
</table>

14.	In a random sample of 75 axle shafts. 12 have a surface finish that is rougher than the specifications will allow. Suppose that a modification is made in the surface finishing process and subsequently a second random sample of 85 axle shafts is obtained. The number of defective shafts in this second sample is 10. Obtain an approximate 95% confidence interval on the difference in the proportions of defectives produced under the two processes	**BTL -5**	Evaluating
	PART-C		
1.	In a sample of 25 observations from a Normal distribution with mean 98.6 and standard deviation 17.2. (i)What is P(92<102) (ii)Find the corresponding probability given a sample of 36.	**BTL -6**	Creating
2.	Mary, an auditor for a large credit card company, knows that, on average, the monthly balance of any customer is Rs.112, and the standard deviation is Rs.56. If Mary audits 50 randomly selected accounts, What is the probability that the sample average balance is (i) Below Rs. 100 (ii)Between Rs.100 and Rs.130	**BTL -6**	Creating
3(a).	Write the type of sampling methods and the uses of standard error?	**BTL -1**	Remembering
3(b).	From a population of 540, a sample of 60 individual is taken. From this sample, the mean is found to 6.2 and the standard deviation 1.368 (i) Find the estimated standard error of the mean. (ii) Construct a 96 % confidence interval for the mean.	**BTL-2**	Understanding
4(a).	Explain the properties of good point estimator.	**BTL -4**	Analyzing
4(b).	What do you mean by interval estimation? Give examples	**BTL-6**	Creating

UNIT III - TESTS OF HYPOTHESIS- PARAMETRIC TESTS

SYLLABUS: Hypothesis testing: one sample and two sample tests for means and proportions of large samples (z-test), one sample and two sample tests for means of small samples (t-test), F-test for two sample standard deviations. ANOVA one and two way.

PART-A

Q. No.	Question	Bloom's Taxonomy Level	Domain
1.	Define Test of Significance.	**BTL-1**	Remembering
2.	What are the Type I and Type II errors?	**BTL-6**	Creating
3.	What do you mean by one tail test?	**BTL-6**	Creating
4.	State the applications of Z-test and t-test.	**BTL-4**	Analyzing
5.	Define critical region	**BTL-1**	Remembering
6.	Distinguish between one tail and two tail tests	**BTL-2**	Understanding
7.	What is the aim of design of experiments?	**BTL-6**	Creating
8.	Distinguish between one-way and two-way analysis of variance.	**BTL-2**	Understanding
9.	When does the Z-test apply?	**BTL-1**	Remembering
10.	Explain SSB , SSW and SSY and relationship in ANOVA.	**BTL-4**	Analyzing

11.	Describe any two applications of t-distribution	**BTL-1**	Remembering
12.	Write the uses of F-test?	**BTL-6**	Creating
13.	Define the level of significance.	**BTL-1**	Remembering
14.	Write the properties of t-distribution?	**BTL-6**	Creating
15.	What is the role of standard error?	**BTL-6**	Creating
16.	Mention any four applications of t-distribution in tests of hypothesis.	**BTL-1**	Remembering
17.	Mention any four uses of Chi-square distribution in test of hypothesis.	**BTL-1**	Remembering
18.	Define null hypothesis ? Explain.	**BTL-6**	Creating
19.	Estimate the standard error of difference between two proportion if p_1=0.10,p_2=0.133 and n_1=50,n_2=75.	**BTL-6**	Creating
20.	Mention any two assumptions made in analysis of variance techniques.	**BTL-1**	Remembering
	PART-B		
1(a).	A study compares the effect of four 1-month point-of-purchase promotions on sales. The unit sales for five stores using all four promotions in different months follow. Free Sample 78 87 81 89 58 One-pack gift 94 91 87 90 88 Cents off 73 73 78 69 83 76Refund by mail 79 83 78 69 81 (i)Compute the mean unit sales for each promotion and then determine the grand mean. (ii)Estimate the population variance using the between column variance.	**BTL-5**	Evaluating
1(b).	From the question 1(a) (i)Estimate the population variance using the within-column variance computed from the variance within the samples. (ii)Calculate the F ratio. At the 0.01 level of significance, do the promotions produce different effects on sales.	**BTL-2**	Understanding
2(a).	In a low cost Toy production system, the molding machine has been set with standard of 1% defective. The 80 sample units produced from this machine shows defective of one unit. Is it necessary to stop the product for corrective mechanism? Test at 5% level of significance	**BTL-5**	Evaluating
2(b).	Block Enterprises, a manufacturer of chips for computers. Is in the process of deciding whether to replace its current semi automated assembly line with a fully automated assembly line. Block has gathered some preliminary test data about hourly chip production, which is summarized in the following table, and it would like to know whether it should upgrade its assembly line. State (and test at a =0.02) appropriate hypothesis to help Block decide.	**BTL-5**	Evaluating
3(a).	Three samples below have been obtained from normal population with equal variance. Test the hypothesis that the means are equal. Sample I : 10 12 18 15 16 Sample II : 7 15 10 12 8 Sample III : 12 8 15 16 15	**BTL-5**	Evaluating
3(b).	The I.Q.s of 16 students from one class of an showed a	**BTL-2**	Understanding

	mean of 107 with a standard deviation of 10, while the I.Q.s of 14 students from another class showed a mean of 112 with a standard deviation of 8. Check whether there is an appreciable difference between the I.Q.s of the two groups at (i) 0.01and (ii) 0.05 level of significance		
4(a).	The following is the information obtained from a random sample of 5 observations. Assume the population has a normal distribution. 30 31 27 32 28 To test if the sample was drawn from a normal distribution with mean less than 30, (i)State the null and alternative hypotheses (ii)Compute the standard error.	**BTL-2**	Understanding
4(b).	From the question 4(a) (i)Determine the test statistic. (ii)Decide at 10% level whether or not the mean value could be greater than 30	**BTL-2**	Understanding
5.	The following data relate to the number of units produced per week by three methods. Method 1 : 170 192 190 120 Method 2 : 160 165 170 172 Method 3 : 182 190 170 178 185 Prepare ANOVA table and write your comments	**BTL-6**	Creating
6(a).	Test if the following samples could have come from two populations with the same means, assuming the population variances are equal. Sample I: Sample size 12, Sample Mean 40.5, Sample variance 2.6 Sample II: Sample size 10, Sample Mean 43.8, Sample variance 3.2	**BTL-5**	Evaluating
6(b).	The weights of 10 people of a locality are found to be 70,67,62,68,61,68,70,64,64,66 kilograms. Is it reasonable to believe that the average weights of the people of locality is greater than 64 kg? Test at 5%level of significance.	**BTL-5**	Evaluating
7(a).	In Town A, there were 850 birds of which 52% was males, while in Town A and Town B combined, the proportion of males in a total of 1200 birds was 0.49. Is there any significance difference in the proportions of male birds in the two Towns?	**BTL-2**	Understanding
7(b).	IQ test result of randomly selected five employees in an organization is given below. Test whether minimum requirement of average IQ level 87 is maintained in that company or not. Employee code: 234, 232, 121, 343, 111 IQ test: 85, 95, 90, 93, 87	**BTL-4**	Analyzing
8(a).	The weights of 8 persons are found to be 60, 65, 70, 68, 62, 63, 60, and 66 kgs. The weights of another group of 12 persons are found to be 70, 60, 58, 56, 50, 48, 52, 56, 52, 50, 54, and 50. Can we conclude that both samples have come from populations with same variances?	**BTL -4**	Analyzing

<table>
<tr><td>8(b).</td><td>ATMs must be stocked with enough cash to meet the requirements of customers over a week, but excess cash results in loss of income as investment opportunities could not be utilized. In an ATM, the average transaction per customer in a week is Rs.8000 with a standard deviation of Rs.1500. If a random sample of 36 customer transactions is examined and it is observed that the sample mean with drawl is Rs.8600, check the belief that the true average withdrawal is no longer Rs.8000. Assume 0.05 level of significance</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>9.</td><td>Apply ANOVA technique and write your comment regarding the sales(in Rs. Lakhs)
<table>
<tr><td colspan="6">Area</td></tr>
<tr><td rowspan="4">Representatives</td><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>A</td><td>12</td><td>16</td><td>20</td><td>18</td></tr>
<tr><td>B</td><td>15</td><td>10</td><td>12</td><td>16</td></tr>
<tr><td>C</td><td>10</td><td>08</td><td>16</td><td>15</td></tr>
</table></td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>10(a).</td><td>A farmer wishes to determine whether there is a difference in yields between two different varieties of wheat I and II. The following data shows the production of wheat per unit area using the two varieties. Can the farmer conclude at significance levels of
(i) 0.05
(ii) 0.01 that a difference exists?</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>10(b).</td><td>Test if the samples could have come from equal population means.
<table>
<tr><td></td><td>Sample A</td><td>Sample B</td></tr>
<tr><td>Size</td><td>200</td><td>400</td></tr>
<tr><td>Mean</td><td>154.8</td><td>164.3</td></tr>
<tr><td>Variance</td><td>15.2</td><td>18.2</td></tr>
</table></td><td>BTL-5</td><td>Evaluating</td></tr>
<tr><td>11(a).</td><td>The number of accidents per week in a city are as follows:
12, 8, 20, 2, 14, 10, 15, 6, 9 and 4. Are these frequencies in agreement with the belief that accident conditions were the same during this 10 weeks period?</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>11(b).</td><td>Two samples are drawn from two normal population. From the following data, Test whether the two samples have the same variance 5% level of significance.
<table>
<tr><td>Sample 1</td><td>60</td><td>65</td><td>69</td><td>74</td><td>76</td><td>82</td><td>85</td><td>87</td><td></td><td></td></tr>
<tr><td>Sample 2</td><td>61</td><td>66</td><td>67</td><td>85</td><td>78</td><td>63</td><td>85</td><td>86</td><td>88</td><td>91</td></tr>
</table></td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>12(a).</td><td>Given a sample mean of 83, a sample standard deviation of 12.5 and a sample size of 22, test the hypothesis that the value of the population mean is 70 against alternative that it is more than 70. Use the 0.025 significance level.</td><td>BTL-2</td><td>Understanding</td></tr>
<tr><td>12(b).</td><td>The following table shows the lifetimes in hours of samples from three different types of television tables manufactured by a company. Determine whether there is a difference between the three types at significance level of 0.01.
Table:</td><td>BTL-2</td><td>Understanding</td></tr>
</table>

	Sample 1	407	411	409			
	Sample 2	404	406	408	405	402	
	Sample 3	410	408	406	408		
13.	The following table shows the yields per acre of hour different plants crops grown on lots treated with three different types of fertilizer. Determine at the 5% significance level whether there is a difference in yield per acre. (i) due to the fertilizers and (ii) due to the crops Table:						**BTL-2** Understanding
		Crop -I	Crop -II	Crop -III	Crop -IV		
	Fertilizer A	4.5	6.4	7.2	6.7		
	Fertilizer B	8.8	7.8	9.6	7.0		
	Fertilizer C	5.9	6.8	5.7	5.2		
14.	Time of 6 machine operator (in minute) in making product is given below. Use paired t-test for training effectiveness.						**BTL -3** Applying
	Machine operator	1	2	3	4	5	6
	Before training	12	23	4	5	16	17
	After training	2	3	10	8	12	6
	PART C						
1(a).	What are non-parametric tests? Point out their advantages and disadvantages?						**BTL -6** Creating
1(b).	The success of a sales engineer in adopting the proven sales technique was found to be 12 out of 30 occasions. Hence he tried a novel technique and achieved success at a rate of 23 out of 40 occasions. Check whether the novel technique is effective at 5% level of significance.						**BTL-2** Understanding
2(a).	The following are the final examination marks of three groups of students who were taught computer by three difference methods. First method: 94 88 91 74 87 97 Second method: 85 82 79 84 61 72 80 Third method: 89 67 72 76 69						**BTL -5** Evaluating
2(b).	A consumer product manufacturing company was selling one of its leading products through a large number of retail shops. Before a heavy advertisement campaign, the average sale per week per shop was 140 dozens. After the campaign, a sample of 26 shops was taken and the mean sales improved to 147 dozens with a standard deviation of 16. Check the effectiveness of the advertisement campaign at 5% level of significance						**BTL-2** Understanding
3.	Discuss the test procedure to test hypothesized population proportion using single sample proportion.						**BTL-1** Understanding

4.	(i)Write the application testing of hypothesis in statistics. (ii)What is t-test? When should we apply a t-test?	**BTL -3**	Applying

UNIT IV: NON-PARAMETRIC TESTS

SYLLABUS: Chi-square test for single sample standard deviation. Chi-square tests for independence ofattributes and goodness of fit. Sign test for paired data. Rank sum test. Kolmogorov-Smirnov – test for goodness of fit, comparing two populations. Mann – Whitney U test and Kruskal Wallis test. One sample run test.

PART-A

Q. No.	Question	Bloom's Taxonomy Level	Domain
1.	Define Rank Correlation test.	**BTL-1**	Remembering
2.	Write the formula in chi square test and any two uses.	**BTL-1**	Remembering
3.	Define Rank-Sum test.	**BTL-1**	Remembering
4.	Mention the advantages of Nonparametric Tests.	**BTL-1**	Remembering
5.	What is the other name or non-parametric test? Why?	**BTL-6**	Creating
6.	When are non parametric tests used?	**BTL-1**	Remembering
7.	What is the null hypothesis framed in Mann-Whitney test?	**BTL-6**	Creating
8.	Write down the working rule for Mann-Whitney U-test and Kruskal-Wallis test.	**BTL-1**	Remembering
9.	Explain sign test.	**BTL-4**	Analyzing
10.	Define one sample run test?	**BTL-1**	Remembering
11.	When is Krushkal-Wallis test used?	**BTL-1**	Remembering
12.	Distinguish between Mann-Whitney U-test and Krushkal-Wallis test.	**BTL-2**	Understanding
13.	Write the contingency 2*2 table for $\aleph^2$ test.	**BTL-5**	Evaluating
14.	Write down the formula to calculate rank correlation coefficient (including tie values).	**BTL-1**	Remembering
15.	Two HR managers (A and B) ranked five candidates for a new position. Their rankings of the candidates are show below: Candidate — Rank by A — Rank by B Nancy — 2 — 1 Mary — 1 — 3 John — 3 — 4 Lynda — 5 — 5 Steve — 4 — 2 Compute the Spearman rank correlation.	**BTL-6**	Creating
16.	Define rank correlation co-efficient.	**BTL-1**	Remembering
17.	The following are the ranks obtained by 10 students in Statistics and Mathematics. Find out the rank correlation coefficient. Statistics: 1 2 3 4 5 6 7 Mathematics: 2 5 1 6 7 4 3	**BTL-4**	Analyzing
18.	Explain Kolmogorov-Smirnov Test for one sample problem.	**BTL-4**	Analyzing
19.	What adjustment is to be done for tie values to find rank correlation.	**BTL-6**	Creating
20.	Mention the properties of linear coefficient of correlation.	**BTL-1**	Remembering

PART -B

1(a).	The scores of a written examination of 24 students, who were trained by using three different methods, are given below. Video cassette A: 74 88 82 93 55 70 65	**BTL-3**	Applying

	Audio cassette B 78 80 65 57 89 85 78 70 Class Room C 68 83 50 91 84 77 94 81 92 Use Krushkal-Wallis test at α = 5% level of significance, whether the three methods of training yield the same results.		
1(b).	Explain Rank sum tests and its applications		
2(a).	The production volume of units assembled by three different operators during 9 shifts is summarized below. Check whether there is significant difference between the production volumes of units assembled by the three operators using Krushkal-Wallis test at a significant level of 0.05. Operator I 29 34 34 20 32 45 42 24 35 Operator II 30 21 23 25 44 37 34 19 38 Operator III 26 36 41 48 27 39 28 46 15	**BTL-3**	Applying
2(b).	Two faculty members ranked 12 candidates for scholarships. Calculate the spearman rank-correlation coefficient and test it for significance. Use 0.02level of significance. Candidate / Rank by Professor A / Rank by Professor B 1: 6, 5 2: 10, 11 3: 2, 6 4: 1, 3 5: 5, 4 6: 11, 12 7: 4, 2 8: 3, 1 9: 7, 7 10: 12, 10 11: 9, 8 12: 8, 9	**BTL-3**	Applying
3(a).	In a study of sedimentary rocks, the following data were obtained from samples of 32 grains from two kinds of sand : Sand I 63 17 35 49 18 43 12 20 47 " 136 51 45 84 32 40 44 25 Sand II 113 54 96 26 39 88 92 53 101 " 48 89 107 111 58 62 Apply Mann-Whitney U test with suitable null and alternative hypotheses.	**BTL -3**	Applying
3(b).	The Molisa's shop has 3 mall locations. She keeps a daily record for each locations of the number of the customers who actually make a purchase. A sample of these data follows. Using Kruskal- Wallis test can you say that at 5% level of significance that her stores have the same number of customers who buy. Eastowin 99 64 101 85 79 88 97 95 90 100 Craborchard 83 102 125 61 91 96 94 89 93 75 Fair forest 89 98 56 105 87 90 87 101 76 89	**BTL -3**	Applying
4(a)	The following are the prices in Rs. per kg of a commodity from 2 random samples of shops from 2 cities *A*&*B*.	**BTL -3**	Applying

	City A	2.7	3.8	4.3	3.2	4.7	3.6	3.8	4.1		
		2.7	2.8	3.2	3.4	3.8	4.4	4.9	3.9	4.7	
	City B	3.7	5.3	4.7	3.6	4.7	4.8	6.0	4.8	4.9	
		3.8	3.9	4.8	5.2	6.1	3.6	3.8			

Apply the run test to examine whether the distribution of prices of commodity in the two cities is the same.

4(b)	Distinguish Nonparametric methods over parametric methods.	**BTL -2**	Understanding
5(a)	From a poll of 800 television viewers, the following data have been accumulated as to,their levels of education and their performance of television stations. We are interested in determining if the selection of Tv station is independent of the level of education.	**BTL -3**	Applying
5(b)	From the question 5(a) (i)Compute the test static (ii)The null hypothesis to be tested at 95% confidence Determine the critical value for this test	**BTL-6**	Creating
6(a)	Apply Mann-Whitney U test to determine if there is a significant difference in the age distribution of the two groups Day :26 18 25 27 19 30 34 21 33 31 Evening :32 24 23 30 40 41 42 39 45 35	**BTL -3**	Applying
6(b)	Apply the K-S test to check that the observed frequencies match with the expected frequencies which are obtained from Normal distribution. (Given at n=5).	**BTL -5**	Evaluating
7	A research company has designed three different systems to clean up oil spills. The following table contains the results, measures by how much surface area (in square meters) is cleaned in one hour. The data were found by testing each method in several trials. Are there systems equally effective? Use the 5% level of significance.	**BTL -1**	Remembering
8(a)	Suppose it is desired to check whether pinholes in electrolytic tin plate are distributed uniformly across a plated coil on the basis of the following distances (in inches) of 10 pinholes from one edge of a	**BTL -1**	Remembering

Education Level

	High school	Bachelor	graduate	Total
Public Broadcasting	50	150	80	280
Commercial stations	150	250	120	520
Total	200	400	200	800

(i) State the null and alternative hypothesis.
(ii) Show the contingency table of the expected frequencies

Test Score	51-60	61-70	71-80	81-90	91-100
Observed Frequency	30	100	440	500	130
Expected Frequency	40	170	500	390	100

Sample A	55	60	63	56	59	55
Sample B	57	53	64	49	62	
Sample C	66	52	61	57		

<table>
<tr><td></td><td>long strip of tin plate 320 inches wide.
<table><tr><td>4.8</td><td>14.8</td><td>28.2</td><td>23.1</td><td>4.4</td><td>28.7</td><td>19.5</td><td>2.4</td><td>25.0</td><td>6.2</td></tr></table>Use Kolmogorov Smirnov test to test the null hypothesis.</td><td></td><td></td></tr>
<tr><td>8(b)</td><td>Explain Mann- WhitneyU test with an example</td><td>BTL-4</td><td>Analyzing</td></tr>
<tr><td>9.</td><td>Ten competitors in a beauty contest are ranked by 3 judges in the following order.
A : 1 6 5 3 10 2 4 9 7 8
B : 3 5 8 4 7 10 2 1 6 9
C : 6 4 9 8 1 2 3 10 5 7
Find out which pair of Judges has awarded the ranks to the nearest common taste of beauty.</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>10(a).</td><td>Test the association of Age and preference of colour of Toy from the following data
<table><tr><td>Age/Colour</td><td>Below 5</td><td>6-10</td><td>Above 10 years</td></tr><tr><td>Pink</td><td>60</td><td>40</td><td>5</td></tr><tr><td>Purple</td><td>30</td><td>30</td><td>30</td></tr><tr><td>Red</td><td>80</td><td>10</td><td>10</td></tr></table></td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>10(b).</td><td>Melisa’s Boutique has three mall locations. Melisa keeps a dairy record for each location of number of customers who actually make a purchase. A sample of those data follows. Using the kruskal-wallis test, can you say at the 0.05 level of significance that her stores have the same number of customers who busy?
<table><tr><td>DSF Mall</td><td>99</td><td>64</td><td>101</td><td>85</td><td>79</td><td>88</td><td>97</td><td>95</td><td>90</td><td>100</td></tr><tr><td>Forest Mall</td><td>83</td><td>102</td><td>125</td><td>61</td><td>91</td><td>96</td><td>94</td><td>89</td><td>98</td><td>75</td></tr><tr><td>Big-Ben Mall</td><td>89</td><td>98</td><td>56</td><td>105</td><td>87</td><td>90</td><td>87</td><td>101</td><td>76</td><td>89</td></tr></table></td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>11(a).</td><td>A brand manager is concerned that her brand’s share may he unevenly distributes through the country. In a survey in which the country was divided into four geographic regions, a random sampling of 100 consumers in each region was surveyed, with the following results:
<table><tr><td></td><td>NE</td><td>NW</td><td>SE</td><td>SW</td><td>TOTAL</td></tr><tr><td>Purchase the brand</td><td>40</td><td>55</td><td>45</td><td>50</td><td>190</td></tr><tr><td>Do not purchase</td><td>60</td><td>45</td><td>55</td><td>50</td><td>210</td></tr><tr><td>Total</td><td>100</td><td>100</td><td>100</td><td>100</td><td>400</td></tr></table>(i) Develop a table of observed and expected frequencies for this problem.
(ii) Calculate the sample $\aleph^2$value.</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>11(b).</td><td>From the question 11(a)
(i)State the null and alternative hypothesis.
(ii)At $\alpha = 0.05$, test whether brand share is the same across the four regions</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>12(a).</td><td>In 30 tosses of a coin, the following sequence of head and tails is obtained HTTHTHHHTHHTTHTHTHHTHTTHTHHTHT
(i) Determine the number of runs</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>12(b).</td><td>From the question 12(a) Test at 0.10 level of significance, whether the sequence is random</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>13.</td><td>An experiment designed to compare three preventative methods</td><td>BTL -3</td><td>Applying</td></tr>
</table>

<table>
<tr><td></td><td>against corrosion yielded the following maximum depths of pits (in thousandths of an inch) in pieces of wire subjected to the respective treatments:
<table>
<tr><td>Method A:</td><td>77</td><td>54</td><td>67</td><td>74</td><td>71</td><td>66</td><td></td></tr>
<tr><td>Method B:</td><td>60</td><td>41</td><td>59</td><td>65</td><td>62</td><td>64</td><td>52</td></tr>
<tr><td>Method C:</td><td>49</td><td>52</td><td>69</td><td>47</td><td>56</td><td></td><td></td></tr>
</table>
Use the Kruskal-Wallis test at the 5% level of significance to test the null hypothesis that the three samples come from identical populations.</td><td></td><td></td></tr>
<tr><td>14.</td><td>The number of defects in printed circuit boards in hypothesized to follow a poisson distribution. A random sample of 60 printed boards have been collected and the number of defects observed. The following table gives the results.
Table:
<table>
<tr><th>No. of defects</th><th>Observed Frequency</th></tr>
<tr><td>0</td><td>32</td></tr>
<tr><td>1</td><td>15</td></tr>
<tr><td>2</td><td>9</td></tr>
<tr><td>3</td><td>4</td></tr>
</table>
Does the assumption of a poisson distribution seem appropriate as a probability model for this process?</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td></td><td>PART C</td><td></td><td></td></tr>
<tr><td>1.</td><td>Explain the Mann-Whitney test procedure with appropriate examples</td><td>BTL-1</td><td>Remembering</td></tr>
<tr><td>2.</td><td>Write the application of Non parametric test and Sign test in statictics.</td><td>BTL-1</td><td>Remembering</td></tr>
<tr><td>3(a).</td><td>The sales records of two branches of a department store over the last 12 months are shown below.(sales figures are in thousands of dollars). We want to use the Mann-Whitney-Wilcoxon test to determine if there is a significant difference in the sales of the two branches.
<table>
<tr><th>Month</th><th>Branch A</th><th>Branch B</th></tr>
<tr><td>1</td><td>257</td><td>210</td></tr>
<tr><td>2</td><td>280</td><td>230</td></tr>
<tr><td>3</td><td>200</td><td>250</td></tr>
<tr><td>4</td><td>250</td><td>260</td></tr>
<tr><td>5</td><td>284</td><td>275</td></tr>
<tr><td>6</td><td>295</td><td>300</td></tr>
<tr><td>7</td><td>297</td><td>320</td></tr>
<tr><td>8</td><td>265</td><td>290</td></tr>
<tr><td>9</td><td>330</td><td>310</td></tr>
<tr><td>10</td><td>350</td><td>325</td></tr>
<tr><td>11</td><td>340</td><td>329</td></tr>
<tr><td>12</td><td>372</td><td>335</td></tr>
</table>
(i) Compute the sum of the ranks for branch A
(ii) Compute the mean μT.</td><td>BTL-4</td><td>Analyzing</td></tr>
<tr><td>3(b).</td><td>From the question 3(a)
(i)Compute σT.</td><td>BTL -6</td><td>Creating</td></tr>
</table>

<table>
<tr><td></td><td>(ii)Use $\alpha = 0.05$ and test to determine if there is a significant difference in the population of the sales of the two branches</td><td></td><td></td></tr>
<tr><td>4(a).</td><td>Independent random samples of ten day students and ten evening students at a university showed the following age distributions. We want to use the Mann-Whitney-Wilcoxon test to determine if there is a significant different in the age distribution of the two groups.
<table>
<tr><th>Day</th><th>Evening</th></tr>
<tr><td>26</td><td>32</td></tr>
<tr><td>18</td><td>24</td></tr>
<tr><td>25</td><td>23</td></tr>
<tr><td>27</td><td>30</td></tr>
<tr><td>19</td><td>40</td></tr>
<tr><td>30</td><td>41</td></tr>
<tr><td>34</td><td>42</td></tr>
<tr><td>21</td><td>39</td></tr>
<tr><td>33</td><td>45</td></tr>
<tr><td>31</td><td>35</td></tr>
</table>
(i) Compute the sum of the ranks for the day students.
(ii) Compute the mean μT.</td><td>BTL-2</td><td>Understanding</td></tr>
<tr><td>4(b).</td><td>From the question 4(a)
(i)Compute σT.
(ii)Use $\alpha = 0.05$ and test for any significant difference in the age distribution of the two populations</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td colspan="4">UNIT – V CORRELATION AND REGRESSION</td></tr>
<tr><td colspan="4">SYLLABUS: Correlation – Coefficient of Determination – Rank Correlation – Regression – Estimation of Regression line – Method of Least Squares – Standard Error of estimate.</td></tr>
<tr><td colspan="4">PART – A</td></tr>
<tr><td>Q.No.</td><td>Question</td><td>Bloom's Taxonomy Level</td><td>Domain</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>1.</td><td>Define regression coefficient?.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>2.</td><td>Define Linear Relationship of Correlation.</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>3.</td><td>Write the Properties of Correlation Coefficient?</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>4.</td><td>What is the angle between the regression lines?</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>5.</td><td>When is linear regression used?</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>6.</td><td>Distinguish between correlation and regression</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>7.</td><td>What is regression analysis?</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>8.</td><td>What do you interpret if the r = 0 , r = + 1 and r = -1?</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>9.</td><td>Specify the range of correlation.</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>10.</td><td>Briefly explain how a scatter diagram benefits the researcher?</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>11.</td><td>Define correlation coefficient between two variables.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>12.</td><td>What is a scatter diagram and write its benefits?</td><td>BTL -6</td><td>Creating</td></tr>
</table>

13.	If the equations of the regression lines are x+2y=5 and 2x+3y=8, find the correlation coefficient between x and y.	**BTL -3**	Applying
14.	Find the mean values of regression lines are 2y-x =50 and 3y-2x =10.	**BTL -1**	Remembering
15.	Write the correlation coefficient in terms of regression coefficients.	**BTL -6**	Creating
16.	Write the Equations of Regression lines.	**BTL -1**	Remembering
17.	Explain the difference between the coefficient of determination and the coefficient of correlation.	**BTL -1**	Remembering
18.	What are the various methods in correlation?	**BTL -1**	Remembering
19.	If the equations of the regression lines are x+2y=5 and 2x+3y=8, find the correlation coefficient between x and y? Use the equations to find the mean of X and Y. If the variance of X is 12, calculate the variance of Y?	**BTL -1**	Remembering
20.	What is positive and negative correlation?	**BTL -1**	Remembering

PART-B

1(a).	The following data pertains of X = Revenue (in '000 of rupees) generated at a Corporate Hospital and Y = Number of Patients (in '00) arrived for the last ten years. X 86 95 75 85 90 98 112 74 100 110 Y 21 24 18 24 22 30 27 18 25 28 Find the Karl Pearson's coefficient of correlation and give your comment.	**BTL -4**	Analyzing
1(b).	Obtain the two regression lines: X 45 48 50 55 65 70 75 72 80 85 y 25 30 35 30 40 50 45 55 60 65	**BTL-5**	Evaluating
2(a).	The revenue generated at a unit and is given below. Fit the trend line using least squares method and estimate the revenue for the year 2013. Year 2005 2006 2007 2008 2009 2010 2011 2012 Revenue (Rs. 00) 268 209 390 290 280 450 350 455	**BTL -2**	Understanding
2(b).	The following table presents the results of a survey of 8 randomly selected families: Annual income (in 000 Rs.): 8 12 9 24 13 37 10 16 Percent allocation for investment 36 25 33 15 28 19 20 22 Find the Karl Pearson's correlation and spearman's rank correlation methods for the above data.	**BTL -4**	Analyzing
3(a).	Given below are the figures of production (in thousand quintals) of a sugar factory. Year 1992 1993 1994 1995 1996 1997 1998 Production 75 80 95 85 95 100 105 Fit a straight line trend by the least squares method and tabulate the trend values.	**BTL -3**	Applying
3(b).	Promotional expenses and sales data for an equipment manufacturer are as follows. Calculate the correlation coefficient and comment.	**BTL -3**	Applying

	Promotional expenses in Lakhs: 7, 10, 9, 4, 11, 5, 3 Sales in units: 12, 14, 13, 5, 15, 7, 4			
4(a).	Data on rainfall and crop production for the past seven years are as follows: Rainfall in inches: 20, 22, 24, 26, 28, 30, 32 Crop production: 30, 35, 40, 50, 60, 60, 55 Find the correlation coefficient and comment on the relationship.	**BTL -3**	Applying
4(b).	The percentage of students getting dream placements in campus selection in a leading technical during the past five years are as follows: Year: 2008, 2009, 2010, 2011, 2012 Percentage: 7.3, 8.7, 10.2, 7.6, 7.4 Find the linear equation that describes the data. Also calculate the percentage of trend	**BTL -4**	Analyzing
5(a).	Let $X_1 and\ X_2$ be two independent variables with mean 5 and 10 and S.D 2 and 3 respectively. Obtain r_{UV} where $U = 3X_1 + 4\ X_2\ and\ V = 3X_1 - X_2$	**BTL -1**	Remembering
5(b).	The following data represent the number of flash drivers sold per day at a local computer shop and their prices. Price(x): 34, 36, 32, 35, 30, 38, 40 Units sold(y): 3, 4, 6, 5, 9, 2, 1 Develop a least squares regression line and explain what the slope of the line indicates. Compute the coefficient of determination and comment on the strength of relationship between x and y. Compute the sample correlation coefficient between the prices and the number of flash drives sold. Use $\alpha = 0.01$ to test the relationship between x and Y.	**BTL -6**	Creating
6(a).	What are the assumptions made by the regression model in estimating the parameters and in significance testing?	**BTL -6**	Creating
6(b).	The equations of two variables X and Y as follows 3X+2Y-26 =0, 6X+Y-31=0 Find the means, regression coefficient & coefficient of correlation.	**BTL -4**	Analyzing
7.	Promotional expenses and sales data for an equipment manufacturer are as follows. Calculate the correlation coefficient and comment Promotional expenses in Lakhs: 7, 10, 9, 4, 11, 5, 3 Sales in Units: 12, 14, 13, 5, 15, 7, 4	**BTL -3**	Applying
8(a).	A gas company has supplied 18,20,21,25 and 26 billion cubic feet f gas, respectively, for the years 2004 to 2008. Find the estimating equation that best describes these data. Calculate the percentage of trend.	**BTL -3**	Applying
8(b).	From the question 8(a) (i)Calculate the relative cyclical residuals (ii)Find the year in which the fluctuation is maximum	**BTL-5**	Evaluating
9.	Given that $\sum X = 130,\ \sum X^2 = 2288,\ \sum Y = 220,\ \sum Y^2 = 5506,$ and $\sum XY = 3467.$	**BTL -6**	Creating

<table>
<tr><td></td><td>Compute correlation coefficient and regression equation of X on Y.</td><td></td><td></td></tr>
<tr><td>10.</td><td>This no. of faculty-owned person computer at the University of Ohm increased dramatically between 1993 & 1995
Year : 1990 1991 1992 1993 1994 1995
No. of PCs : 50 110 550 1020 1950 3710
i. Develop a linear estimating equation that best describes these data
ii. Develop a second-degree estimating equation that best describes these data.
iii. Estimate the no. of PCs that will be in use at the university in 1999, using both equation.
iv. If there are 8000 faculty members at the university, which equation is the better predictor? Why?</td><td>BTL -4</td><td>Analyzing</td></tr>
<tr><td>11.</td><td>Campus stores has been selling the believe it or not. Wonders of statistics study guide for 12 semesters and would like to estimate the relationship between sales and no. of sections of elementary statistics taught in each semester. The following data have been collection:
<table>
<tr><td>Sales(units)</td><td>33</td><td>38</td><td>24</td><td>61</td><td>52</td><td>45</td><td>65</td><td>82</td><td>29</td><td>63</td><td>50</td><td>79</td></tr>
<tr><td>No. of sections</td><td>3</td><td>7</td><td>6</td><td>6</td><td>19</td><td>12</td><td>12</td><td>13</td><td>12</td><td>13</td><td>14</td><td>15</td></tr>
</table>
i. Develop the estimating equation that best fits the data.
Calculate the sample coefficient of determination and the sample coefficient of correlation</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>12(a).</td><td>A coffee shop owner believes that the sales of coffee at his coffee shop depend upon the weather. He has taken a sample of 6 days. The results of the sample are given below
<table>
<tr><th>Cups of Coffee sold</th><th>Temperature</th></tr>
<tr><td>350</td><td>50</td></tr>
<tr><td>200</td><td>60</td></tr>
<tr><td>210</td><td>70</td></tr>
<tr><td>100</td><td>80</td></tr>
<tr><td>60</td><td>90</td></tr>
<tr><td>40</td><td>100</td></tr>
</table>
Which variable is the dependent variable?
Compute the least square estimated line
Compute the correlation coefficient between temperature and the sales of coffee. Predict sales of a 90 degree day.</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>12(b).</td><td>From the question 12(a)
(i)Compute the correlation coefficient between temperature and the sales of coffee.
(ii)Predict sales of a 90 degree day.</td><td>BTL -6</td><td>Creating</td></tr>
<tr><td>13.</td><td>
<table>
<tr><td>X independent variable</td><td>80</td><td>120</td><td>90</td><td>240</td><td>130</td><td>370</td><td>100</td><td>160</td></tr>
<tr><td>Y independent variable</td><td>36</td><td>25</td><td>33</td><td>15</td><td>28</td><td>19</td><td>20</td><td>22</td></tr>
</table>
(i) Develop a regression equation that best describes this data.
(ii) Calculate karl-pearson correlation coefficient.</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>14.</td><td>From the following data, find the equations of the regression lines
<table>
<tr><th></th><th>Marks in Maths</th><th>Marks in English</th></tr>
<tr><td>Mean</td><td>62.5</td><td>39</td></tr>
<tr><td>S.D</td><td>9.5</td><td>10</td></tr>
</table></td><td>BTL -2</td><td>Understanding</td></tr>
</table>

<table>
<tr><td></td><td>Coefficient of correlation between marks in Maths & English = 0.60
i. Estimate the marks in English when marks in Maths is 70
ii. Estimate the marks in Maths corresponding to 54 marks in English</td><td></td><td></td></tr>
<tr><td></td><td colspan="2">PART C</td><td></td></tr>
<tr><td>1.</td><td>Given below are five observations collected in a regression study on two variables, x and y
<table>
<tr><td>X</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Y</td><td>4</td><td>4</td><td>3</td><td>2</td><td>1</td></tr>
</table>
(i)Develop the least square estimated regression equation.
(ii)Compute the correlation co-efficienent.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>2.</td><td>What are assumption made by the regression model in estimating the parameters and in significance testing.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>3.</td><td>In what ways can regression analysis to be used?</td><td>BTL-2</td><td>Understanding</td></tr>
<tr><td>4.</td><td>Find the correlation coefficient of X and Y
<table>
<tr><td>X</td><td>30</td><td>32</td><td>35</td><td>40</td><td>48</td><td>50</td><td>52</td><td>55</td><td>57</td><td>61</td></tr>
<tr><td>Y</td><td>1</td><td>0</td><td>2</td><td>5</td><td>2</td><td>4</td><td>6</td><td>5</td><td>7</td><td>8</td></tr>
</table></td><td>BTL -4</td><td>Analyzing</td></tr>
</table>