

25. Given that two regression equations are $8x - 10y + 66 = 0$ and $40x - 18y - 314 = 0$. Identify the regression line of y on x and x on y . Obtain regression coefficients and the correlation coefficient. Find the mean of x and y . If the standard deviation of x is 4, find the standard deviation of y .

26. For a student's t distribution with n degrees of freedom, prove that

$$E\left(\frac{1}{t}\right) = \frac{(n-2)(n-4)\dots(n-2k)}{(n-1)(n-3)\dots(n-2k+1)}$$

SECTION - D

Answer any 2 questions out of 4 questions, each question carries 8 marks.

27. a) Explain χ^2 test for goodness of fit and χ^2 test for independence.

b) In an experiment on immunization of 22 human beings from cholera, the following results were obtained. Draw your inference in the efficiency of the vaccine. Test at 5 percentage level of significance.

Not inoculated	5	17
Inoculated	8	14

28. Fit a binomial distribution to the following data and test its goodness of fit. 182 families (which have the possibility of an albino child being born) had the following distribution of albinos among the first 3 children.

No. of albinos	0	1	2	3
No. of families	77	80	59	26

29. Fit a curve to the form $Y = a + bX + cX^2$ to the following data.

X	1	2	3	4	5	6	7	8	9	10
Y	1.3	8.0	27.6	17.4	28.0	60.0				

30. The following data give downy mildew infection status by professional caterers.

RATER	SERVICE STATION									
	1	2	3	4	5	6	7	8	9	10
A	98	75	90	88	85	88	78	70	88	93
B	98	88	80	88	70	88	70	87	84	87
C	98	80	48	87	78	87	83	80	80	88
D	98	88	70	87	83	70	84	80	80	88
E	87	88	83	88	80	80	78	80	80	88

Analyze the data and discuss whether there is any significant difference between ratings for downy mildew infection.



Reg. No.:

Name:

**IV Semester B.Sc. Hon's (Mathematics) Degree (Reg./Supp./Imp.)
Examination, April 2019
(2016 Admission Onwards)
BHM 404 : ADVANCED STATISTICAL TECHNIQUES**

Time : 3 Hours

Max. Marks : 60

SECTION - A

Answer any 4 questions out of 5 questions, each question carries 1 mark.

1. How will you obtain χ^2 - distribution from a standard normal distribution ?
2. What is the relation for mean and variance of a χ^2 - distribution with n degrees of freedom ?
3. Define test statistic.
4. If both regression coefficients are given how will you find out correlation coefficient ?
5. What is the range of multiple correlation coefficient ?

SECTION - B

Answer any 6 questions out of 9 questions, each question carries 2 marks.

6. Define sampling distributions. Give an example.
7. What is curve fitting ?
8. Give two statistics which follows Student's t distribution.
9. Mention two applications of t -distribution.
10. What is the difference between Karl Pearson correlation coefficient and Spearman's rank correlation coefficient ?
11. Obtain the 95 percentage confidence interval for the mean of a normal population $N(\mu, \sigma)$, when σ is known.



12. Define interval estimation.
13. Write the normal equations for fitting a parabola of the form $y = ax^2 + bx + c$.
14. Find the angle between two regression lines.

SECTION – C

Answer **any 8** questions out of 12 questions, each question carries **4** marks.

15. Derive the mgf of a χ^2 – distribution and hence derive its mean and variance.
16. A manufacturing process is expected to produce goods with a specified weight with variance less than 5 units. A random sample of size 10 was found to have variance 6.2 units. Is there reason to suspect that the process variance has increased? ($\alpha = 0.05$)
17. Discuss the additive property of chi-square distribution.
18. A sample of size 8 from a normal population is 6, 8, 11, 5, 9, 11, 10, 12. Can such a sample be regarded as drawn from a population with mean 7 at 2 percentage level of significance?
19. Form the regression line of Y on X for the given data
 X : 36 23 27 28 28 29 30 31 33 35
 Y : 29 18 20 22 27 21 29 27 29 28
20. Show that correlation coefficient $(r) = \frac{\sigma_x^2 + \sigma_y^2 + \sigma_{x-y}^2}{2\sigma_x\sigma_y}$, where σ_x^2 , σ_y^2 and σ_{x-y}^2 are the variances of x, y and x – y respectively.
21. The coefficient of rank correlation of the mark obtained by 10 students was found to be 0.5. It was later discovered that the differences in ranks in 2 subjects obtained by one of the students was wrongly taken as 3 instead of 7. Find the correct coefficient of correlation.
22. Explain paired t-test.
23. Explain the principle of least squares.
24. Calculate the rank correlation coefficient for the following data on heights of fathers and sons
 Ht. of father : 65 63 67 64 68 62 70 66 68 67
 Ht. of son : 68 66 68 65 69 66 68 65 71 67



25. Given that two regression equations are $8x - 10y + 66 = 0$ and $40x - 18y - 214 = 0$. Identify the regression line of y on x and x on y. Obtain regression coefficients and the correlation coefficient. Find the means of x and y. If the standard deviation of x is 4, find the standard deviation of y.
26. For a student's t distribution with n degrees of freedom, prove that

$$\mu_{2r} = \frac{(2r-1)(2r-3)\dots 3.1n^r}{(n-2)(n-4)\dots(n-2r)}$$

SECTION – D

Answer **any 2** questions out of 4 questions, **each** question carries **6** marks.

27. a) Explain χ^2 test for goodness of fit and χ^2 test for independence.
 b) In an experiment on immunization of 22 human beings from cholera, the following results were obtained. Draw your inference in the efficiency of the vaccine. Test at 5 percentage level of significance.

	Died	Survived
Inoculated	2	10
Not inoculated	6	4

28. Fit a binomial distribution to the following data and test its goodness of fit. 192 families (which have the possibility of an albino child being born) had the following distribution of albinos among the first 3 children.
 No. of children : 0 1 2 3
 No. of Families : 77 90 20 5
29. Fit a curve of the form $y = ae^{bx}$ to the following data.
 x : 1 2 3 4 5 6
 y : 3.2 9.0 27.6 80.4 250 600
30. The following table gives quality rating of service stations by professional raters :

RATER	SERVICE STATION									
	1	2	3	4	5	6	7	8	9	10
A	99	70	90	99	65	85	75	70	85	92
B	96	65	80	95	70	88	70	51	84	91
C	95	60	48	87	48	75	71	93	80	93
D	98	65	70	95	67	82	73	94	86	80
E	97	65	62	99	60	80	76	92	90	89

Analyse the data and discuss whether there is any significant difference between ratings or between service stations.