



28. Fit a Binomial distribution to the following data test the goodness of fit

X :	0	1	2	3	4	5	6
F :	21	48	20	16	9	4	2

29. Calculate Pearson's correlation coefficient for the following data

X :	65	66	67	67	68	69	71	73
Y :	67	68	64	68	72	70	69	70

30. Professionals from various disciplines participated in a study on job-related stress. A random sample of size 100 was selected from each group of professionals (physicians, engineers and lawyers) and each person was asked to evaluate the level of job-related stress as low, moderate or high. The results are as follows.

	L	M	H
Physicians	5	25	70
Engineers	25	25	50
Lawyers	10	30	60

Test whether the stress is related to the nature of the job.

Total	a	b	a+b
A	a	b	a+b
B	c	d	c+d
Total	a+c	b+d	a+b+c+d



Reg. No. : .....

Name : .....

**IV Semester B.Sc. Hon's (Mathematics) Degree (Regular/Supple/  
Improv.) Examination, May 2018**  
**BHM 404 : ADVANCED STATISTICAL TECHNIQUES**  
**(2016 Admission Onwards)**

Time : 3 Hours

Max. Marks : 60

**SECTION - A**

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

1. Define degrees of freedom.
2. When  $r = 0$  what is the angle between two regression lines ?
3. What is the standard deviation of a chi-square distribution with 8 degrees of freedom ?
4. If the regression coefficients are  $-0.4$  and  $-0.6$ , find the correlation coefficient.
5. Write the test statistic for testing the significance of mean of a normal population. (4x1=4)

**SECTION - B**

Answer **any 6** questions out of 9 questions, **each** carrying **2** marks. (6x2=12)

6. What are the assumptions underlying t test ?
7. Describe a scatter diagram.
8. Give any three applications of chi-square test.
9. A random sample of size 15 which is taken from a normal population has mean 23 and s.d. 2.3. Find the 95% confidence interval for mean of the population.





10. Describe Spearman's rank correlation coefficient.
11. Distinguish between partial and total correlations with examples.
12. Find the angle between two regression lines.
13. The correlation coefficient between two variables  $x$  and  $y$  is 0.6. If  $\sigma_x = 1.5$ ,  $\sigma_y = 2.0$ ,  $\bar{x} = 10$  and  $\bar{y} = 20$ , find the two regression lines.
14. Write the normal equations for fitting a parabola of the form  $y = a + bx + cx^2$ .

## SECTION - C

Answer any 8 questions out of 12.

(8×4=32)

15. Describe chi-square goodness of fit test.
16. In a certain experiment to compare two types of animal foods A and B, the following results of increase in weights were observed in animals.
 

Animal No.	1	2	3	4	5	6	7	8
Food A	49	53	51	52	47	50	52	53
Food B	52	55	52	53	50	54	54	53

Assuming that the two samples of animals are independent, can we conclude that food B is better than food A.

17. Fit a line to the given data.

Y: 3    2    1    1    0.5

X: -2   -1   0   1   2

18. Show that Chi-square distribution tends to normal distribution.
19. The two regression lines are  $8x - 10y = -66$  and  $40x - 18y = 214$ . Find the (i) average values of  $x$  and  $y$  (ii) correlation coefficient, (iii) standard deviation of  $y$  if standard deviation of  $x$  is 4.
20. Describe method of least squares for fitting a straight line.



21. A random sample of 5 college students is selected and their grades in mathematics and statistics are found to be

**Mathematics** : 85    60    73    40    90

**Statistics** : 93    75    65    50    80

Calculate rank correlation coefficient.

22. Show that for 2 degrees of freedom, the probability  $P$  of a value of  $\chi^2$  greater than  $\chi_0^2$  is  $\exp(-1/2\chi_0^2)$  and hence show that  $\chi_0^2 = 2\log_e(1/P)$ . Deduce the value of  $\chi_0^2$  when  $P = 0.05$ .
23. Derive the regression line of  $y$  on  $x$ .
24. Given that  $x = 4y + 5$  and  $y = kx + 4$  are two lines of regression, show that  $0 \leq k \leq 1/4$ . If  $k = 1/8$ , find the means of the variables and ratio their variances.
25. Find the moment generating function of Chi-square distribution and hence prove the additive property.
26. For a student's  $t$  distribution with  $n$  degrees of freedom, prove that
 
$$\mu_{2r} = \frac{(2r-1)(2r-3)\dots 3 \cdot 1 \cdot n^r}{(n-2)(n-4)\dots(n-2r)}$$

## SECTION - D

Answer any 2 questions out of 4.

(2×6=12)

27. Show that the value of  $\chi^2$  for the contingency table

Classes	A	A'	Total
B	a	b	a + b
B'	c	d	c + d
Total	a + c	b + d	a + b + c + d

Calculate from the independent frequencies is  $\chi^2 = \frac{(a+b+c+d)(ad-bc)^2}{(a+b)(c+d)(b+d)(a+c)}$ .