

Register Number :

Name of the Candidate :

**1 3 4 3**

**B.Sc. DEGREE EXAMINATION, 2010**

**( MATHEMATICS WITH COMPUTER APPLICATIONS )**

( THIRD YEAR )

( PART - III )

( PAPER - VII )

**720. MATHEMATICAL STATISTICS**

May ]

[ Time : 3 Hours

Maximum : 100 Marks

*Answer any FIVE questions.*

*All questions carry equal marks.*

(5 × 20 = 100)

1. (a) State and prove addition theorem of probability. (10)

**Turn over**

(b) If X and Y are two random variables having joint density function

$$f(x, y) = \begin{cases} e^{-(x+y)} & ; 0 \leq x, y \leq 0 \\ 0 & ; \text{otherwise,} \end{cases}$$

find :

- (i)  $P(X < 1)$ .
- (ii)  $P(X > Y)$ .
- (iii)  $P(X + Y < 1)$ .

2. (a) Fit a straight line to the following data and estimate the value of y corresponding to  $x = 6$  :

x :	0	5	10	15	20	25
y :	12	15	17	22	24	30

(b) Find the moment generating function of the binomial distribution. (10)

(b) State and prove the invariance property of maximum likelihood estimator. (8)

9. (a) Explain completed randomised design by means of example. (10)

(b) Calculate the Fisher's index number for the following data :

Commodities	2006		2007	
	Price	Quantity	Price	Quantity
A	5	10	4	6
B	2	8	6	5
C	4	14	5	10
D	2	19	2	13

10. (a) State and prove the fundamental theorem of finite differences. (10)

(b) Use Lagrange's interpolation formula to find the value of f(6), given

$f(3) = 168,$   
 $f(7) = 120,$   
 $f(9) = 72,$   
 $f(10) = 63.$  (10)

- (b) Find the mean and the standard deviation of the mean of random sample drawn from a population with mean  $\mu$  and S.D.  $\sigma$ . (10)
6. (a) Explain the test of significance for difference of proportions. (10)
- (b) Samples of students were drawn from two universities and from their weights in kg, means and standard deviations are calculated given below :
- |                |                |                |
|----------------|----------------|----------------|
|                | University - A | University - B |
| Mean           | 55             | 57             |
| S.D.           | 10             | 15             |
| Size of sample | 400            | 100            |
- Is the difference between the means significant? (10)
7. (a) Derive Snedecor's F - distribution. (10)
- (b) Find  $100(1 - \alpha)\%$  confidence limits for the parameter  $\lambda$  of the Poisson distribution. (10)
8. (a) Describe Neymann - Pearson's method for confidence interval. (12)

3. (a) If the random variables X and Y have the joint probability density function
- $$f(x, y) = \begin{cases} \frac{1}{8}(x+y) & ; 0 \leq x \leq 2, 0 \leq y \leq 2 \\ 0 & ; \text{otherwise} \end{cases}$$
- find the correlation co-efficient between X and Y. (10)
- (b) Derive the recurrence relation for moment of a normal distribution. (10)
4. (a) Show that the correlation co-efficient is independent of change of origin and scale. (8)
- (b) Calculate the correlation co-efficient for the following data : (12)
- |     |    |    |    |    |    |    |    |    |    |    |
|-----|----|----|----|----|----|----|----|----|----|----|
| X : | 75 | 30 | 60 | 80 | 53 | 35 | 15 | 40 | 38 | 48 |
| Y : | 85 | 45 | 54 | 91 | 58 | 63 | 35 | 43 | 45 | 44 |
5. (a) With usual notations, prove for the *chi* - square distribution
- $$\mu_{r+1} = 2r(\mu_r + n\mu_{r-1}), r \geq 1. \quad (10)$$
- Turn over**