Register Number :

Name of the Candidate :

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B.Sc. DEGREE EXAMINATION, 2008

(MATHEMATICS)

(THIRD YEAR)

(PART - III - A - MAIN)

(PAPER - IX)

760. MATHEMATICAL STATISTICS

(Including Lateral Entry)

December] [Time : 3 Hours

Maximum : 100 Marks

Answer any FIVE questions.
Statistical Tables can be used.
All questions carry equal marks.

$(5 \times 20 = 100)$

1. (a) State and prove Baye's Theorem.

Turn over

(b) A random variable X has the following probability function.

Value of x	: 0	1	2	3	4	5	6	7
p (x)	: 0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

(i) Find k.

(ii) Evaluate

$$p(x < 6),\ p(x \geq 6)$$

and $p(0 < x < 5)$.

(iii) If $p(x \leq \alpha) > 1/2$,

find the minimum value of α.

(10 + 10)

2. (a) State and prove product theorem on expectation for two random variables.

(b) Find the expectation of the number of failures preceding the first success in an infinite series of independent trials with constant probability of success.

(10 + 10)

10. (a) The annual sales of a company are given below :

Estimate the sales for the year 1980.

Year :	1970	1975	1980	1985	1990	1995
Sales : In Lakhs of Rs.	125	163	–	238	282	380

(b) The values of x and y are given below :

x :	5	6	9	11
y :	12	10	14	16

Find the value of y when $x = 10$, by using Lagrange's interpolation formula.

(10 + 10)

Examine at 5% level, whether the two populations have the same variance. ($F_{0\cdot 05} = 4\cdot 15$).

(b) Construct a four yearly centred moving average from the following data :

Year :	1920	1930	1940	1950	1960	1970	1980
Sales :	129	131	106	91	95	84	93

(10 + 10)

9. Calculate Fisher's ideal index number from the following data and show that it satisfies time reversal test and factor reversal test.

Commodity	1979		1980	
	Price	Quantity	Price	Quantity
A	10	49	12	50
B	12	25	15	20
C	18	10	20	12
D	20	5	40	2

(10 + 10)

3. (a) Fit a second degree parabola to the following data :

X :	1	2	3	4	5	6	7	8	9
Y :	2	6	7	8	10	11	11	10	9

(b) Calculate the co-efficient of correlation between X and Y for the values given below :

X :	2	5	7	9	19	16
Y :	25	27	26	29	34	39

4. (a) The following table gives the marks obtained by 11 students in Mathematics and Statistics. Find the rank correlation coefficient.

Mathematics :	40	46	54	60	70	80	82	85	85	90	95
Statistics :	45	45	50	43	40	75	55	72	65	42	70

(b) The correlation co-efficient between the variables X and Y is 0·6.

If

$$\sigma_x = 1{\cdot}5,\ \sigma_y = 2,\quad \bar{x} = 10$$

and

$$\bar{y} = 20,$$

find the equations of two regression lines. (10 + 10)

5. (a) With usual notation, for a Poisson distribution,

prove that

$$\mu_{r+1} = m\left(r\,\mu_{r-1} + \frac{d}{dm}\,\mu_r\right)$$

(b) State the properties of normal curve.

(10 + 10)

6. (a) Explain the four types of sampling with examples.

(b) The means of two large samples of sizes 1000 and 2000 are 67·5 inches and 68 inches respectively. Can the samples be regarded as drawn from the same population with standard deviation 2·5 inches ? (10 + 10)

7. (a) State and prove Neyman Pearson lemma.

(b) Two random samples give the following results :

$$n_1 = 10,\quad \Sigma\,(x - \bar{x})^2 = 90$$

$$n_2 = 12,\quad \Sigma\,(y - \bar{y})^2 = 108$$

Test whether the samples have come from the normal population with the same variances. (10 + 10)

8. (a) In a test, given to two groups of students drawn from two normal populations, the marks obtained were as follows :

Group – I	:	18	20	36	50	49	36	34	49	47
Group – II	:	29	28	26	35	30	44	46	–	–

Turn over