

TIME : 2 Hrs.

MARKS : 60

- Note :
- 1) Solve any TWO out of FOUR from section - I, and any THREE out of SIX from section II
 - 2) Simple function calculator is allowed.
 - 3) Figures to the right indicate full marks.

Section - I

Q. 1. a) find dy / dx for the following. [6]

i) $y = 10\sqrt{x} + 6e^x - 11\log x$

ii) $y = (3e^x + 5x)(4x^5 - 3\log x + 2^x)$

iii) $y = \frac{e^x + 7}{2^x + 9x^2}$

b) A person borrowed Rs. 30,000 from two acquaintances. For one loan, he paid 5% p.a. and for the other 7% p.a.. After one year, he paid Rs. 1600 as interest. How much money did he borrow at each rate? [6]

Q. 2. a) The Cost of producing x items is given by $2x^2 + 3x + 98$. Find the average cost, the marginal cost and the marginal average cost functions. Find the marginal cost and marginal average cost when $x = 5$. Find x for which marginal cost = average cost. [6]

b) A loan of Rs. 50,000 is to be returned in 3 equal monthly instalments, the rate of interest being 24% p.a. Find the EMI using the reducing balance method. Find the interest and principal repayment components of the EMI for each month. [6]

Q. 3. a) i) Find $\frac{dy}{dx}$ for $y = x^{-7}5^x + e^x \cdot \log x$ [3]

ii) Find $\frac{d^2y}{dx^2}$ if $y = x^3 + 3^x$ [3]

b) The difference between the simple interest and the compound interest on a certain principal for 4 years at 8% p.a. is Rs. 648. Find the principal. [6]

Q. 4. a) A firm produces an output of a certain product at a total cost given by $C = x^3 - 4x^2 + 7x$. Find at what output average cost is minimum and what is the minimum average cost. [6]

b) Find the accumulated value at the end of 4 years and the present value of an immediate annuity of Rs. 50000 p.a. for 4 years at 4% p.a. [6]

Section - II

Q. 5. a) Calculate Karl Pearson's coefficient of correlation for the following data :

X :	17	8	12	13	10	12	
Y :	13	7	10	11	8	9	[6]

b) Find trend values using 4 yearly moving average method :

Year	:	1	2	3	4	5	6	7	8	9	10
Production	:	52	73	85	94	82	104	113	125	120	136
(in 100 units)											

Q. 6. a) Distribution of marks in Economics and Mathematics of nine students in a certain test is given below. Find Spearman's rank correlation coefficient.

Marks in Economics	:	45	25	28	42	43	40	39	37	42
Marks in Mathematics	:	70	68	80	85	70	75	65	59	54

b) The following table is pay off of four alternative plans under each of five possible states of nature :

	S_1	S_2	S_3	S_4	S_5
A_1	36	24	15	24	28
A_2	36	24	34	40	30
A_3	28	24	19	28	28
A_4	32	24	19	28	30

Obtain i) maximin ii) maximax iii) Laplace solution. [6]

Q. 7. a) Find Laspeyre's, Paasche's and Fisher's index numbers from the following data for the year 1995 with base 1990.

Commodity	Price in Rs.		Quantity	
	1990	1995	1990	1995
A	10	12	20	22
B	13	13	23	24
C	16	18	20	18
D	20	18	5	6
E	18	20	7	8

b) A news paper distributor assigns probabilities to the demand for a magazine as follows :

Copies demanded	:	10	20	30	40
Probability	:	0.4	0.3	0.2	0.1

A copy of a magazine sells for Rs. 14/- and costs Rs. 12. What can be maximum possible EMV if the distributor can return unsold copies for Rs. 10 each. [6]

Q. 8. a) For a bivariate distribution, the following results are obtained -

Mean value of $x = 65$.

Mean value of $y = 53$

Standard deviation of $x = 4.7$

Standard deviation of $y = 5.2$

Correlation coefficient $r = 0.78$

Find the two regression equations and hence obtain -

i) the most probable value of y when $x = 63$

ii) the most probable value of x when $y = 50$

[6]

b) Determine the equation of a straight line which best fits the following data. Compute the trend values for all years from 1994 to 2000 and estimate for 2002.

[6]

Year	: 1994	1995	1996	1997	1998	1999	2000
Exports	: 80	90	92	83	94	99	102

Q. 9. a) The regression of y on x for certain bivariate data was found to be $10y = 3x + 155$ and that of x on y was $10x = 7y + 10$. Find \bar{x} , \bar{y} and r . [6]

b) A factory manufacturing household furniture is developing a substantial backlog and the firm's management is considering three courses of action : Arrange for subcontracting (A_1), begin overtime production (A_2) and construct new facilities (A_3). The correct choice depends largely upon future demand which may be low, medium or high with the respective probabilities as 0.20, 0.50 and 0.30. The pay off matrix is as follows.

Acts	Pay off	State of nature (Demand)		
		Low	Medium	High
	Prob.	0.20	0.50	0.30
A_1		20	60	60
A_2		30	70	110
A_3		-140	30	210

What decision should be taken using

i) EMV ii) EOL

[6]

Q. 10.a) Compute cost of living index from the following information - [6]

Group	Weight	Price (in Rs.) in	
		Base Year	Current Year
Food	60	120	160
Clothing	30	40	60
Fuel & light	30	80	110
House Rent	40	30	45
Miscellaneous	25	50	70

b) Represent the following decision problem with pay off table as follows, using decision tree and suggest best action. [6]

Acts	Events		
	E ₁	E ₂	E ₃
A ₁	20	30	50
A ₂	40	45	30
A ₃	25	26	28
A ₄	30	25	35
Probability	0.3	0.5	0.2

