Maths

(3 Hours)

[Total Marks : 100]

N.B. : (1) All questions are **compulsory**.

(2) Figures to the **right** indicate **full** marks.

(3) Use of **simple non-programmable calculator** is **allowed**.

(4) **Graph papers** will be provided on **request**.

Section - I

1. Attempt **Any Four** of the following:

    (a) Find the derivatives $\dfrac{dy}{dx}$ of the following -   5

    (i) $y = \left(e^x + 2\right)\left(2x^2 + x + 4\right)$ (ii) $y = \dfrac{e^x + 2^x}{x^2 + 1}$

    (b) The cost of manufacturing x items of a product is given by $c = 2x^2 + 3x + 10$. Find the total cost, average cost and the marginal cost if 10 items are manufactured.   5

    (c) If the demand function is given by $D = 15 - 4p - p^2$, where D = demand and p = price. Find elasticity of demand when $p = 2$ 5

    (d) Find the output at which profit is maximum and the maximum profit if, the total cost functions are given by $R = 260 - 3x^2$ and $C = 500 + 20x$.   5

    (e) If MR is Rs. 25 and elasticity of demand w. r. t. price is 2. Find AR.   5

2. Attempt **Any Four** of the following:

    (a) The simple interest at 20% p.a. on a certain some of money for 4 years is Rs. 25,600. Find the compound interest on the sum at the same rate for the same period.   5

    (b) The difference between simple interest and compound interest on a sum for 4 years at 10% p.a. is Rs. 1025.60 . Find the principle amount.   5

    (c) Find the number of years for which on annuity of Rs. 10,000 is paid at end of each year, if its accumulated amount works out to be Rs. 53,680 with interest compounded at 20% p.a.   5

    (d) For an immediate annuity to be paid for 4 years with interest compounded at 9% p.a. the present value is Rs. 10,000. Find the annuity payment for each year.   5

    (e) A person has to pay Rs. 40,000 at the end of 2 years and another Rs. 20,000 at the end of 4 years from now. If he decideds to settle the payment now, what will he have to pay presently in lieu of the above payments, if the interest is compounded at 10% p.a. ?   5

[TURN OVER]

Section - II

3. Attempt **Any Four** of the following:

(a) Find Pearson's coefficient of correlation for the following data :-   **5**

Marks in English	1	2	3	4	5	6	7
Marks in Economics	2.8	4.3	5.2	6.5	6.9	7.8	9

(b) For a bivariate distribution, $\bar{x}=25.3$, $\bar{y}=152.4$, standard deviation of x = 1.8, standard deviation of y = 5.7 and the coefficient of correlation r = 0.82. Find the regression euation of x on y and estimate x when y = 156.9 .   **5**

(c) Calculate spearman's rank correlation coefficient for the following data :-   **5**

x	56	37	65	60	54	51	70
y	50	42	55	48	51	53	47

(d) Given the two regression equations as 4x - y - 23 = 0 and 3x - 2y + 4 = 0. Find
(i) the mean values of x and y   (ii) the coefficient of correlation.   **5**

(e) Describe the use of scatter diagram for ascertaining correlation between two variables.   **5**

4. Attempt **Any Four** of the following:

(a) Fit the linear trend by the method of least squares for the following data and estimate the trend for the year 2015:   **5**

Year :	2007	2008	2009	2010	2011	2012	2013
Expenditure : in '000 Rs.	80	90	92	83	94	99	92

(b) From the following data calculate Marshelt Edgeworth's Price Index Numbers   **5**

Commodity	Base Year		Current Year	
	Price	Quality	Price	Quality
A	12	25	18	30
B	10	20	15	30
C	8	15	10	20

(c) Find 4 yearly moving averages :   **5**

Year	2003	2004	2005	2006	2007	2008	2009	2010
Sales in '000 Rs.	110	104	78	105	109	120	115	110

[TURN OVER]

(d) Construct index number number using family budget method for the following data :- 5

Commodity	Base Year Price	Current Year Price	Weights
A	15.50	18.75	30
B	10.75	12.25	15
C	6.00	7.50	40
D	9.25	11.00	15

(e) What is a time series ? Describe the various components of a time series.   5

5. Attempt **Any Four** of the following:

(a) A Help-line claims that 90% of their customers are given help. If 10 customers are selected at random, find probability that out of them, the numbers of customers helped is (i) exactly 6   (ii) more than 8   5

(b) The average number of phone calls per minute in a call centre is 4. Find the probability that during a specific minute, the number of cells is (i) Only 1   (ii) at least 2   (Green e^{-4} = 0.0183)   5

(c) The average selling price of housses in a city is Rs. 5,00,000 with a standard deviation of Rs. 1,00,000. Assuming the distribution to be normal, find (i) The percentage of houses that sell for more than Rs. 5,00,000   (ii) The percentage of houses selling between Rs. 4,00,000 and 6,00,000.   5
(Given that for a standard normal variable Z, the area between Z = 0 and Z = 1 is 0.3413)

(d) If mean and variance of a Binomial distribution are 4 and 2 respectively, find probability that number of successes is (i) Only 3   (ii) at least 7   5

(e) Write the probability density function of Normal distribution and state the important properties of the Normal curve.   5