Time: 2½ hrs.   Marks:75

Note: 1. All questions are compulsory with internal choice.
                 2. Draw neat diagrams wherever necessary.
                 3. Figures to the right indicate full marks.

Q.1   (A) Fill in the blanks with the correct answer from the alternatives given below.   (08)
           (Attempt any 8)

       i) _____ can be extra money a person has to pay while repaying the loan.
           a) Interest
           b) Principal
           c) Amount
           d) Annuity

       ii) The simple interest on Rs 20,000 for 3.5 years at 6% rate of interest is _____.
           a) 4100
           b) 4200
           c) 4300
           d) 4400

       iii) The full form of EMI is _____.
           a) Equal Monetary Interest
           b) Equal Monthly Interest
           c) Equated Monthly Instalment
           d) Equal Monetary instalment

       iv) A matrix of order m*1 is called a
           a) Row matrix
           b) Unit matrix
           c) Null matrix
           d) Column matrix

       v) The value of a determinant with two identical rows is _____.
           a) 0 (Zero)
           b) 1
           c) -1
           d) Infinity

       vi) A system of three linear equations in three unknowns can be solved using _____.
           a) Newton's rule
           b) Cramer's rule
           c) Poisson rule
           d) Binomial rule

       vii) The derivative of x with respect to x is _____.
           a) 0

b) 1
c) $\sqrt{x}$
d) 2

viii) The derivative of a derivative is called _____.
    a) Anti derivative
    b) First order derivative
    c) Second order derivative
    d) Secondary derivative

ix) The forward differences of y are denoted by the operator _____.
    a) μ
    b) Δ
    c) ∇
    d) Σ

x) While using Newton's interpolation formula, the values of argument x are _____.
    a) Equidistant
    b) Not equally spaced
    c) At an interval of 1 only
    d) At an interval of 5 only

Q.1 (B) State whether the following statements are true or false. (Attempt any 7) (07)

i) The compound interest for any amount is always more than the simple interest for the same amount.

ii) In EMI calculations, the rate of interest is compounded quarterly.

iii) To calculate simple interest, we should know the values of principal and rate of interest only.

iv) If A is a given matrix of order m*n, the negative of the matrix A is denoted by -A.

v) Matrix A and B are said to be conformable for multiplication AB if the number of columns of A is same as the number of rows of B.

vi) A matrix obtained by interchanging rows and columns of a given matrix is called its transpose.

vii) The derivative of 17 with respect of x is 0.

viii) The rate of change of cost w.r.t the number of units produced is the marginal cost.

ix) The backward differences are denoted by E.

x) The values of y = f(x) can be found using Newton's interpolation formula.

Q.2 (a) In how many years a sum of Rs 50,000 will amount to Rs 60,000 at 10% simple interest? (07)

(b) Mukesh took a loan of Rs 30,000 from a bank on simple interest at the rate of 11% p.a. He also took a loan from his friend of Rs 40,000 at 10% p.a. on simple interest. On which principal the simple interest will be more after 3 years and how much more? (08)

Q.2 (p) A sum of Rs 12,000 becomes Rs 17,280, at 20% compound interest p.a. Find the period. **(07)**

(q) Solve the following equations in three unknowns using cramer's rule: **(08)**

$7x + 3y + z = 11$

$2x - y + 3z = 4$

$x + y + z = 3$

Q.3 (a) Using the definition of equality of matrices, find the values of a, b, c, x, y and z if, **(07)**

$$\begin{bmatrix} a+4 & b-3 & c+7 \\ 2x+1 & y-4 & z+1 \end{bmatrix} = \begin{bmatrix} 9 & 2 & 5 \\ 7 & 4 & 6 \end{bmatrix}$$

(b) If $A = \begin{bmatrix} 1 & 4 & 3 \\ 2 & 0 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & -1 \\ 1 & 3 & 4 \\ 0 & 5 & 6 \end{bmatrix}$, find the product matrix AB. **(08)**

OR

Q.3 (p) Differentiate w.r.t x the following function: **(07)**

$X^4 + e^x + 5^x - \log x + 7$

(q) Examine for maxima and minima the function $f(x) = 2x^3 - 9x^2 - 24x + 11$ **(08)**

Q.4 (a) The cost of manufacturing x items of a product is given by $C = 2x^2 + 3x + 10$. Find the total cost, average cost, marginal cost and the marginal average cost if 10 items are manufactured. **(07)**

(b) If $y = f(x) = x^3 + x^2 + x + 1$, find the values of y for x = 0,1,2,3,4. Form the backward difference table and verify that the third differences are constant. **(08)**

OR

Q.4 (p) Estimate f (3.6) using Newton's backward interpolation formula from the following data: **(07)**

X	0	1	2	3	4
F(x)	2	2	6	20	50

(q) Estimate f (22) using newton's forward interpolation formula: **(08)**

X	20	25	30	35	40
Y = f(x)	11.4	10.9	10.2	9.1	7.8

Q.5 (a) Anurag took a loan of Rs 60,000 with 10% interest per month, to be repayment in 5 months. Calculate the EMI using reducing balance method. Also calculate the interest and the principal repayment components for each EMI. **(07)**

(b) If $A = \begin{bmatrix} 2 & 5 \\ 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 7 \\ 6 & 3 \end{bmatrix}$, find 2A + 3B. Also prove that 2(A+B) = 2A + 2B. **(08)**

OR

Q.5 Write a short note on : (Attempt any 3) **(15)**

i) Types of matrices