Duration:2 hours   Max.Marks:80

INSTRUCTIONS:
1. All questions are compulsory.
2. Start each new question on a fresh page.
3. Figures to the right indicate full marks
4. Graph paper is provided by request.

Q.1   Attempt the following: (5 X 4 = 20)

a   Find the equation of a line having slope 5 and passing through the point (0,1).

b   Find the derivative of the following w.r.t x if
   i) $y = x^8 + 30 + \frac{1}{x^4}$ ii) $y = 3^x + e^x$

c   If $f(x) = 2x$ and $g(x) = x + 10$, find $f(g(x))$ and $g(f(x))$.

d   Evaluate the following integrals:
   i) $\int (e^x + 5 + \frac{1}{x} + x^2)\, dx$

OR

Q.I   Attempt the following: (5 X 4 = 20)

v   Find the coordinates of the point dividing the segment joining the points
        $(1, 2), (3, 4)$ internally in the ratio 2:5.

w   Find the derivative of the following w.r.t x if
   i) $y = x^{-6} - \sqrt{x}$ ii) $y = x(logx)$.

x   If $f(x) = x^2 + 3$ and if $f(x + 1) = f(x - 1)$, find x.

y   Evaluate the following integrals:
        i)$\int_1^6 \left(logx + \frac{3}{x}\right) dx$

Q.2   Attempt the following: (5 X 4 = 20)

a   Find $\lim\limits_{x \to 2} \frac{x^2+4x-12}{x-2}$.

b   If the total cost function is given by C=$4x^2$ +5, find the average cost and marginal
        cost when x=5.

c   Solve graphically, the following L.P. Problem.
        Maximize z= $800x + 300y$
        subject to : $4x + 6y \leq 120,\ 10x + 3y \leq 180,\ x \geq 0, y \geq 0$.

d   For the function $f(x, y) = x^2 + y^2$. Find f_x and f_y at $(1, 2)$.

OR

Q.II   Attempt the following: (5 X 4 = 20)

v   If f is continuous at $x = 3$ where
$$f(x) = x^2 - x + a \qquad 0 \leq x \leq 3$$
$$= 5x \qquad 3 < x \leq 4$$
        find a.

w   Find out when $f(x) = x^3 - 27x + 10$ is increasing and decreasing on **R**.

x   Formulate the LPP:
        A company produces soft drinks that have a contract which requires that a minimum
        of 80 units of the chemical A and 60 units of the chemical B to be present in each
        bottle of the drink. The chemicals are available in a prepared mix from to two
        suppliers S and T. Supplier S has a mix of 4 units of A and 2 units of B that cost Rs.
        10. Supplier T has a mix of 1 unit of A and 1 unit of B that costs Rs. 4. How many
        mixes from S and T should the company purchase to minimize the cost and honor the
        contract requirements?

y   For $f(x,y) = 2x^2 + 3xy$, find $f(x,y)$, when
        (i) $x = 2$ (ii) $y = 1$ (iii) $(x,y) = (2,1)$.

Q.3   Attempt the following: (5 X 4 = 20)

a   Find the simple interest on the amount Rs. 2000 invested for 2 years at rate of 10%
        per annum?
b   Find the equation of a line passing through the point (0, 6) and B (-5,0).

c   The marginal cost function of manufacturing x units of a product is $5 + 16x - 3x^2$.
        Find the total cost function if fixed cost is Rs. 100.
d   If $y = 6x^2 + 2x + 1$. Find $\frac{d^2y}{dx}$.

OR

Q.III   Attempt the following: (5 X 4 = 20)
v   Find the present value of an annuity of Rs. 3,500 per year for 3 years at 12% per
        annum.
w   Show that P(1,4), Q (4,6) and R (10,10) are collinear.
x   If a marginal revenue function is given as $MR = 10x^2 + 6x - 3$, find an
        expression for the total revenue function (TR).
y   Find the extreme values of the function $f(x) = x^4 - 4x$.

Q.4   Attempt the following: (5 X 4 = 20)

a   A bank has decided to collect Fixed Deposit at the rate of 12% p.a., to be
        compounded half yearly basis. Find the effective rate of interest.

b   Find the equation of the line through (3,1) and parallel to the line with equation $2x-y=4$.

c   If marginal revenue (MR) =50 and the elasticity of demand w.r.t price is 5, find the price.

d   If the demand function for a certain commodity is $80 - 3x^2$, find the demand consumer's surplus at $x = 5$.

OR

Q.IV   Attempt the following   (5 X 4 = 20)

v   Find the sum borrowed by Mohit from a bank on compound interest at 5% per year, to be calculated annually, if he had to pay back Rs. 26,460 after 2 years

w   AB is the diameter of a circle with center C. If A= (1,-2) and C= (-3,4), find the coordinates of B.

x   A manufacturer sells x items at a price p=310-x.The total cost of producing these items is $C(x) = x^2 + 30x + 5$. Find x for which the profit is maximized.

y   Evaluate: $\int_1^2 (1 + x^2 - x^3)dx$.