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 3 and passing through the point (4,1).
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 $f(x) = 2(x + 1)$ and $g(x) = x + 10$, find $f(g(x))$ and $g(f(x))$.
d   Evaluate the following integrals:

   i) $\int (e^x + 5 + \frac{1}{x} + x^2)\, dx$

e   Company A makes a profit of Rs 500 on a refrigerator of cost price Rs 5000,
        company B makes a profit of Rs 600 on a refrigerator of cost price Rs 8000. Find
        which company is making a better percentage profit.

OR

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

v   Show that the lines with equations 2y=x+1 and 3x-6y-8=0 are parallel.
w   Find the derivative of the following w.r.t x if

   i) $y = x^{-6} - \sqrt{x}$ ii) $y = \frac{\log x}{x}$

x   Let A = {1, 2, 3, 4} and B = {5, 7, 9}. Determine (i) A × B (ii) B × A
        (iii) Is A × B = B × A ? (iv) Is n (A × B) = n (B × A) ? Give reasons.

y   Evaluate the following integrals:

   i) $\int_1^6 \left(\log x + \frac{3}{x}\right) dx$

z   Mukund scores 75% or 60 marks in the Mathematics test. Find the maximum marks
        for this test.

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

a   Find $\lim\limits_{x \to 2} \frac{x^2 + 4x - 12}{x^2 - 2x}$.
b   If the total cost function is given by C=4x² +5x+2, find the average cost and marginal
        cost when x=2.
c   Solve graphically, the following L.P. Problem.
        Maximize z= $800x + 300y$
        subject to : $4x + 6y \le 120,\ 10x + 3y \le 180,\ x \ge 0, y \ge 0$.

d   For the function $f(x, y) = x^2 + 3xy + y^2$. Find f_x and f_y at (1, 2).

e   The ratio of the present age of a father to that of his son is 5 : 3. Ten years hence the ratio would be 3 : 2. Find their present ages.

OR

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

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

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 $f(x, y) = x^2 + 2xy - y^2 + 10$, find $f(x, y)$, when
    (i) $x = 2$ (ii) $y = 1$ (iii) $(x, y) = (2,1)$.

z   Monthly incomes of Ram and Rahim are in the ratio 5 : 7 and their monthly expenditures are in the ratio 7 : 11. If each of them saves Rs.60 per month. Find their monthly income.

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

a   On 20% discount sale, an article cost Rs. 596. What was the original price of the article.

b   Find the equation of a line passing through the points A (1, 6) and B (-5,0).

c   The marginal cost function of manufacturing x units of a product is $5 + 16x - 3x^2$. The total cost of producing 5 items is Rs. 500. Find the total cost function.

d   If $y = \log(6x^2 + 2x + 1)$. Find $\frac{dy}{dx}$.

e   Find the point on the x axis whose distance from (7,5) is 13 units.

OR

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

v   A shopkeeper marks his goods 20% above cost price, but allows 30% discount for cash. Find his net loss percent.

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   If $y = e^x - 3x^2 + 10000$ Find $\frac{d^2y}{dx^2}$.

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

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

a   Three persons can fit an AC unit in the house in 2 hours, one person fell ill before the work started, how long would the work take now?

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 $x = 5$.

e   Find the extreme values of the function $f(x) = x^4 - 4x$.

OR

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

v   5 pipes are required to fill a petrol tank in 2 hrs 20 mins. How long will it take if 4 pipes of the same type are used.

w   If (3, k) lies on the line joining (-1,4) and (2,5), find k.

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

z   Find the derivative of the following w.r.t x if $y = (x + 5)logx$ +(x+1)($3x^2$).

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