

INSTRUCTIONS:

1. All questions are compulsory.
2. Start each new question on fresh page.
3. Figures to the right indicate full marks
4. Graph paper and Log tables are provided with request.

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

- a. Find at what ratio the point (5, 2) divides internally the line joining the points A(8, -4) and B(3, 6).
- b. Find the derivative of the following w.r.t x if

i) $y = (x^2 + 2)(x - 5)$

ii) $y = \frac{e^{x+3}}{e^{x-3}}$

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

- d. Evaluate the following integrals:

i) $\int (3 - 20x)^7 dx$

ii) $\int (x + 3)(x - 2) dx$

Or

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

- w. If the distance between two points (5, a) and (8, 4) is 5, find the value of a.

- x. Find the derivative of the following w.r.t x if

i) $y = x^5 + x^{-3} - \sqrt{x} + e^x + 7^x - \log x$

- y. If $f(x) = 2x^2 + 7$ and if $f(x + 1) = f(x + 2)$, find x.

- z. Evaluate the following integrals:

i) $\int_2^3 (1 - 2x) dx$

ii) $\int_0^6 (x + 5)(x - 6) dx$

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

- a. Find $\lim_{x \rightarrow 2} 4x^2 + kx + 6 = 15$, find k.
- b. Find the values of the demand, for which the supply function $f(x) = x^2 - 4x + 7$ is (i) increasing (ii) decreasing

- c. Solve graphically, the following L.P. problem.

Maximize $z = x + y$

subject to: $x + 2y \leq 8$, $3x + 2y \leq 12$, $x \geq 0$, $y \geq 0$

- d. For the function $f(x, y) = x^2 + 2xy - y^2 + 10$. Find f_x and f_y at (1, 2).

OR

Q.11 Attempt the following: (5 X 4 = 20)

- w. Examine the continuity of at f at $x = 0$ if

$$f(x) = \frac{e^{3x} - 1}{4x} \quad x \neq 0$$

$$= \frac{3}{4} \quad x = 0$$

- x. If the total cost function is given by $C = 4x^2 + 7x + 3$, find the average cost and marginal cost when $x = 4$

- y. Solve graphically the following L.P. P

Minimize $z = 5x + 2y$

subject to: $10x + 2y \geq 20$, $5x + 5y \geq 30$, $x \geq 0$, $y \geq 0$.

- z. The demand function for a certain commodity is given by

$$D(p_1, p_2) = 5 + 2p_1p_2 - p_1^3.$$

Find the Marginal demand at $p_1 = 2$ and $p_2 = 6$.

Q.3 Attempt the following:

(5 X 4 = 20)

- If the compound rate of interest is 16% p.a. payable quarterly, find effective rate.
- Find the coordinates of the point dividing the segment joining the point (-5,-3) and (2,-4) externally in the ratio 2:3.
- If the Marginal Revenue function for a certain product is $MR = 12 - 3x^2 + 4x$. Find the Revenue function and the corresponding demand function.
- A firm produces an output of x tons at a total cost $C = x^3 - 6x^2 + 30x$. Find the output at which the average cost is minimum.

OR

Q.III Attempt the following:

(5 X 4 = 20)

- Vivek deposits annuity of Rs. 5000 in a bank at the end of year @ 9% p.a. compound interest, for a period of 10 years. Find the total amount at the end of 10th year.
- Find the equation of the line passing through the point (1, 2) and perpendicular to a line $2x - 10y - 7 = 0$.
- The demand function for a certain commodity is $p = 100 - 5x$. Find the consumer's surplus at $x = 4$.
- If $y = e^x + 3x^3 - 3x$ Find $\frac{d^2y}{dx^2}$.

Q.4 Attempt the following:

(5 X 4 = 20)

- Calculate the present value of an annuity for an yearly investment of Rs. 7000 @ 12% p.a. compound interest for a period of 9 years.
- Write down the equation of a line passing through the points A(1,6) and B(-5,0).
- If the demand function is given by $D = 12 + 4p - p^2$, p being the price Find price elasticity of demand when $p=3$.
- Evaluate: $\int \left[\frac{x^2 + x - 12}{x - 3} \right] dx$

Or

Q.IV Attempt the following:

(5 X 4 = 20)

- A bank offers fixed deposits for 5 years under the following schemes:
 - At 15% if the interest to be calculated half yearly.
 - At 12% if the interest to be calculated quarterly.

State which scheme is more beneficial to the public?

- Show that points A (2,2), B(3,4) and C(4,1) are the vertices of a right angled triangle.
- The cost function for x units of a product produced and sold by a company is $C(x) = 250 + 0.005x^2$ and the revenue is given as $R(x) = 4x$. Find how many items should be produced to maximize the profit. What is the maximum profit?
- Evaluate: $\int_0^2 (e^{2x+3} - 2x) dx$