

Q. 2 . Attempt the following:

(5 x 4 = 20)

- a) Find the ratio in which the point P (- 1, 11) divides the join of A (8, 2) and B (5, b). Hence find b.
- b) A person has to put a sum in an investment at 8% p.a. compounded rate of interest so as to get an amount of ₹1,00,000 after 3 years. How much money should he invest presently?
- c) Integrate the following w.r.t. x
 i) $\frac{x+2}{(x+1)^2}$ ii) $\frac{x^4+1}{x^2}$
- d) Find i) $\lim_{x \rightarrow 3} x^2 - 9 \left(\frac{1}{x+3} + \frac{1}{x-3} \right)$
 ii) $\lim_{x \rightarrow 1} \frac{x-1}{2x^2 - 7x + 5}$
- e) The total revenue $R = 500 + \frac{x^2}{10}$ where x is the number of units sold. Find
 i) average revenue ii) marginal revenue iii) marginal revenue when $x = 20$.

OR

Q. II. Attempt the following:

(5 x 4 = 20)

- p) AB is the diameter of a circle with centre C. If C is (7, - 2) and B is (- 3, 5), find the co-ordinates of A
- q) Mr. X invested ₹ 5000 in a bank as a short term deposit for 9 months at 5% per annum to be compounded quarterly. Find the amount received by him on maturity.
- r) Integrate the following w.r.t. x
 i) $(2x+3)^4 - \frac{1}{(2-3x)^4}$ ii) $\frac{x^2+4x+3}{x+1}$
- s) A function f is defined as $f(x) = \frac{x}{x+3}$ for $x < 2$
 $= 3$ for $x = 2$
 $= \frac{x+2}{2}$ for $x > 2$
- Discuss the continuity of f at $x = 2$.
- t) The total cost function is given as $C = 2x^2 + 3x + 1000$. Find
 i) average cost ii) marginal cost iii) marginal cost when $x = 4$.

Q. 3. Attempt the following:

(5 x 4 = 20)

a) Solve the following LPP by graphical method:

$$\begin{aligned}
 &\text{Maximise } z = 50x + 100y \\
 &\text{subject to } x + 6y \leq 30 \\
 &\quad \quad \quad x + y \leq 12 \\
 &\quad \quad \quad x \geq 0, y \geq 0.
 \end{aligned}$$

b) The supply function for a particular commodity is $p = 2x - 3$. Find the producer's surplus when $p = 3$.

c) The average cost is given by $AC = 80 - 12x + x^2$ where x is the number of units produced. Find the number of units produced for minimum AC.

d) If $z = 2x^6 + 5x^2y^4 + 3y^6$ show that $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = 6z$.

e) Find $\frac{dy}{dx}$ if i) $y = \frac{\sqrt{x}}{2x+5}$ ii) $y = e^{x^3-2x+5}$

OR

Q. III. Attempt the following:

(5 x 4 = 20)

p) Solve the following LPP by graphical method:

$$\begin{aligned}
 &\text{Minimise } z = 40x + 37y \\
 &\text{subject to } 10x + 3y \geq 180 \\
 &\quad \quad \quad 2x + 3y \geq 60 \\
 &\quad \quad \quad x \geq 0, y \geq 0.
 \end{aligned}$$

q) The demand function for a commodity is $p = 9 - x^2$. Find the consumer's surplus when $x = 2$.

r) Find the maximum and minimum value of the function $f(x) = x^3 - 12x$.

s) $z = 5x^2y^3 + 3x^2y + x^3$. Is $\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x}$?

t) Find $\frac{dy}{dx}$ if i) $y = \frac{1}{x^2+5}$ ii) $y = (3x+4)\sqrt{x}$

Q. 4. Attempt the following:

(5 x 4 = 20)

a) Find the equation of the line passing through the point $(-3, 4)$ and parallel to the line $2x - 5y = 100$.

b) Ms Shah invested ₹40000 at the end of each year in a financial institution that offered her interest compounded at 8% p.a. Find the accumulated amount at the end of 4 years.

c) If $\int_a^3 (x+1)^2 dx = \frac{56}{3}$, find a.

- d) The demand function for a commodity is given by $y = 200 - 6x^2$ where y is the demand and x is the price. Find the price elasticity of demand when $x = 5$.
- e) The marginal revenue function is given by $MR = 7 - 4x - x^2$. Find the total revenue function and the average revenue function.

OR

Q. IV. Attempt the following:

(5 x 4 = 20)

- p) If $A(3, 4)$, $B(5, k)$, $C(-4, 2)$ and $D(k, 7)$ are four points such that line AB is perpendicular to line CD then find the value of k .
- q) Find the accumulated amount if payment of ₹ 600 is made at the end of each year for 7 years at interest rate of 14% compounded annually.
- r) If $\int_1^2 (3x^2 + 2x + k)dx = 8$, find k .
- s) If $y = x^2e^x$, find the elasticity of y w.r.t. x .
- t) The marginal cost function for producing x items is given by $MC = 6 + 10x - 6x^2$. Find the total cost function and the average cost function if the fixed cost is 3.

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