Duration:2 hours   Max. Marks :80

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 the point P which divides internally the line joining the points A(8,-4) and B(3,6) in the ratio 1:2.

   b. Find the derivative of the following w.r.t x if
   $$y = (x^2 + 2)(x - 5).$$

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

   d. Evaluate the following integrals:
   $$\int (x + 5)(x - 2)\, dx.$$

Or

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

   w. Find the distance between two points (5,2) and (8,4).

   x. Find the derivative of the following w.r.t x if
       i) $y = x^5 + x^{-3} + e^x + 7^x - logx.$

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

   z. Evaluate the following integrals:
       $\int_{2}^{3}(1 - 2x)dx$

Q.2   Attempt the following: (5 X 4 = 20)
   a. Find $\lim_{x\to 2} 4x^2 + kx + 6 = 15$, 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 $f(x, y) = x^2 + 2xy - y^2$. Find f_x and f_y at $(0, 1)$.

OR

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

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

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

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

x. I f 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 :$5x + y \geq 10,\ x + y \geq 6, x \geq 0, y \geq 0.$

z. The demand function for a certain commodity is given by
$$D(p_1, p_2) = 6 + 3p_2 - p_1{}^3.$$
Find the Marginal demand at $p_1 = 1$ and $p_2 = 3$.

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

a. If the compound rate of interest is 10% p.a. payable quarterly, find effective rate.

b. Find the coordinates of the point dividing the segment joining the point (-5,-3) and (2,-4) externally in the ratio 2:3.

c. The demand function of a monopolist is given by p=1500-2x-x ^{2}. Find (i) the revenue function, (ii) the marginal function when x=20.

d. 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)

w. Vivek deposits annuity of Rs. 5000 in a bank at the end year@ 9% p.a. compound interest, for a period of 5 years. Find the total amount at the end of 5th year.

x. Find the equation of the line passing through the point (1, 2) and having slope 2.

y. The demand function for a certain commodity is $p = 100 - 5x$. Find the consumer's surplus at $x = 4$

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

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

a. Calculate the present value of an annuity for yearly investment of Rs.7000 @ 12% p.a. compound interest for a period of 9 years.

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

c. If the demand function is given by $D = 12 + 4p - p^2$, p being the price Find price elasticity of demand when p=3.

d. Evaluate: $\int \left[\frac{x^2+x-12}{x-3}\right] dx$

Or

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

w. What will an investment of Rs.7, 500 amounts to in five years at 7.5% compound interest per annum?

x. Show that the lines with equations 2y=x+1 and 3x-6y-8=0 are parallel.

y. The cost function for x units of a product produced and sold by a company is C(x) =250+0.005x² and the revenue is given as R=4x.Find how many items should be produced to maximize the profit. What is the maximum profit?

z. Evaluate:$\int_0^2 (e^{2x+3} - 2x)dx$.