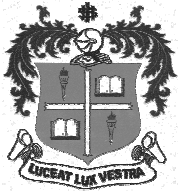


LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



B.Sc. DEGREE EXAMINATION – MATHEMATICS

THIRD SEMESTER – NOVEMBER 2011

MT 3203/MT 3204 - BUSINESS MATHEMATICS

Date : 12-11-2011
Time : 1:00 - 4:00

Dept. No.

Max. : 100 Marks

PART A

Answer ALL the questions

(10 x 2 =20)

1. Define total revenue function.
2. The marginal cost function of a product is given by $\frac{dc}{dq} = 100 - 10q + 0.1q^2$, where q is the output. Obtain the total cost function of the firm under the assumption that its fixed cost is Rs. 500.
3. Find the differential coefficient of $\frac{x^2-1}{x^2+1}$ with respect to x .
4. Define the price elasticity of demand.
5. Evaluate $\int xe^x dx$
6. Prove that $\int_a^c f(x)dx + \int_c^b f(x)dx = \int_a^b f(x)dx$.
7. If $A = \begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$, find A^2 .
8. Find the rank of $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 5 & 7 \end{pmatrix}$.
9. If $\frac{x+1}{(x-1)(2x+1)} = \frac{A}{x-1} + \frac{B}{2x+1}$ then find A and B .
10. Define objective function.

PART B

Answer any FIVE from the following

(5 x 8 =40)

11. The total cost C for output x is given by $C = \frac{2}{3}x + \frac{35}{2}$. Find (i) Cost when output is 4 units
(ii) Average cost when output is 10 units (iii) Marginal cost when output is 3 units.
12. If AR and MR denote the average and marginal revenue at any output, show that elasticity of demand is equal to $\frac{AR}{AR-MR}$. Verify this for the linear demand law $p = a + bx$.
13. If $y = x^{x^x}$, find $\frac{dy}{dx}$.
14. Investigate the maxima and minima of the function $2x^3 + 3x^2 - 36x + 10$.
15. Integrate $\frac{x^3}{(x^2+1)^3}$ with respect to x .
16. If $A = \begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix}$ show that $A^2 = 2A$ and $A^3 = 4A$.
17. Find the adjoint of the matrix $A = \begin{pmatrix} 1 & 4 & 5 \\ 3 & 2 & 6 \\ 0 & 1 & -3 \end{pmatrix}$.
18. Resolve the following into partial fractions: $\frac{x^2+1}{(x-3)(x-1)^2}$

PART C

Answer any TWO from the following

(2 x 20 =40)

19. (a) If the marginal revenue function for output x is given by $R_m = \frac{6}{(x+2)^2} + 5$, find the total

revenue by integration. Also deduce the demand function.

(b) Let the cost function of a firm is given by the following equation:

$$C = 300x - 10x^2 + \frac{1}{3}x^3, \text{ where } C \text{ stands for cost and } x \text{ for output.}$$

Find the output at which

(i) Marginal cost is minimum.

(ii) Average cost is minimum.

(iii) Average cost is equal to Marginal cost.

(8+12)

20. (a) If $y = (x + \sqrt{1+x^2})^m$, show that $(1+x^2)y_2 + xy_1 = m^2y$.

(b) Find the elasticities of demand and supply at equilibrium price for demand function

$$p = \sqrt{100 - x^2} \text{ and supply function } x = 2p - 10, \text{ where } p \text{ is price and } x \text{ is quantity.}$$

(10+10)

21. (a) Integrate $\frac{x+5}{(x+1)(x+2)^2}$ with respect to x .

(b) Evaluate $\int x^2 e^{3x} dx$.

(10+10)

22. (a) Solve the equations $5x - 6y + 4z = 15$; $7x + 4y - 3z = 19$; $2x + y + 6z = 46$ by inverse matrix method.

(b) Solve the following linear programming problem graphically:

$$\text{Maximize } Z = 2x_1 + 5x_2$$

$$\text{Subject to } x_1 + x_2 \leq 24$$

$$3x_1 + x_2 \leq 21$$

$$x_1 + x_2 \leq 9$$

$$x_1, x_2 \geq 0.$$

(12+8)
