



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.A., B.SC. & B.COM DEGREE EXAMINATION – ECONO., STATS, COMM. CORP. SEC.

FOURTH SEMESTER – APRIL 2016

MT 4205 - BUSINESS MATHEMATICS

Date: 27-04-2016
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

PART A

Answer ALL questions:

(10 x 2 = 20)

1. Define cost function of a firm.
2. Find the equilibrium price and quantity for the functions $Q_d = 2 - 0.02P$ and $Q_s = 0.2 + 0.07P$.
3. If $x^2 + y^2 - 2x = 0$, then find $\frac{dy}{dx}$.
4. Find the elasticity of demand for the function $x = \frac{27}{p^3}$.
5. Evaluate $\int (3x^{-1} + 4x^2 - 3x + 8) dx$.
6. Evaluate $\int_2^4 (3x - 2)^2 dx$.
7. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 \\ 2 & -3 \end{pmatrix}$, find $A + B$.
8. Show that $\begin{vmatrix} 1 & x & y+z \\ 1 & y & z+x \\ 1 & z & x+y \end{vmatrix} = 0$.
9. If $\frac{x+1}{(x-1)(2x+1)} = \frac{A}{x-1} + \frac{B}{2x+1}$ then find A and B .
10. Define feasible solution.

PART B

Answer ANY FIVE questions:

(5 X 8 = 40)

11. The total cost function of a firm is given by $C = 0.04q^3 - 0.9q^2 + 10q + 10$. Find
(a) Average cost (AC) (b) Marginal cost (MC) (c) Slope of AC (d) Slope of MC
12. If $y = (x + \sqrt{1+x^2})^m$ then show that $(1+x^2)y_2 + xy_1 = m^2y$.
13. Find the maximum and minimum values of the function $f(x) = x^4 + 2x^3 - 3x^2 - 4x + 4$.
14. Evaluate $\int \frac{xe^x}{(x+1)^2} dx$.
15. Evaluate $\int \frac{x}{(x-1)(2x+1)} dx$.
16. Prove that $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$.
17. Resolve into partial fraction $\frac{x}{(x-1)(x^2+x+1)}$.
18. Find the inverse of the matrix $A = \begin{pmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{pmatrix}$.

PART C

Answer ANY TWO questions:

(2 X 20 = 40)

19. (a) 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 $p = a + bx$.

(b) Find the first and second order partial derivatives of $\log(x^2 + y^2)$. **(10+10)**

20. (a) Let the cost function of a firm be given by the following equation: $C = 300x - 10x^2 + \frac{1}{3}x^3$ where C stands for cost and x for output. Calculate (i) output, at which marginal cost is minimum (ii) output, average cost is minimum (iii) output, at which average cost is equal to marginal cost.

(b) 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. **(10+10)**

21. (a) Find CS and PS for the demand curve $D(x) = 16 - x^2$ and supply curve $S(x) = 4 + 2x^2$.

(b) Solve the system of the following equations using matrix method $x + y + z = 7$;

$$x + 2y + 3z = 16; x + 3y + 4z = 22.$$

22. (a) A dealer wishes to purchase a number of fans and sewing machines. He has only Rs.5760 to invest and has space for at most 20 items. A fan costs him Rs.360 and a sewing machine Rs.240. His expectation is that he can sell a fan at a profit of Rs.22 and sewing machine at a profit of Rs.18. Assuming that he can sell all the items that he can buy, how should he invest his money in order to maximize his profit?

(b) A factory manufactures two articles A and B. To manufacture the article A, a certain machine has to be worked for 1.5 hours and in addition a craftsman has to work for 2 hours. To manufacture the article B, the machine has for 1.5 hours. In a week the factory can avail of 80 hours of machine time and 70 hours craftsman's time. The profit on each article A is Rs. 5 and that on each article B is Rs. 4. If all the articles produced can be sold away, how many of each kind should produce to earn the maximum profit per week. Formulate the linear programming problem. **(10+10)**
