LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.A., B.COM. DEGREE EXAMINATION – **ECONOMICS, COMMERCE, COR. SEC.**

THIRD SEMESTER – NOVEMBER 2016

MT 3203 / MT 3204 - BUSINESS MATHEMATICS

Date: 10-11-2016   Dept. No.   Max. : 100 Marks
Time: 09:00-12:00

Part A

Answer ALL the questions   **(10 x 2 =20)**

1. *Define total cost function.*

2. The marginal cost function of a product is given by $\frac{dc}{dq} = 100 - 10q + 0.1\, q^2$, 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 $9x^4 - 7x^3 + 8x^2 - \frac{8}{x} + \frac{10}{x^2}$ with respect to x.

4. Define the price elasticity of demand.

5. Evaluate $(3 - 2x - x^4)dx$.

6. Prove that $\int_a^b f(x) + \int_b^c f(x) = \int_a^c f(x)$.

7. Integrate $\int_{-1}^{1}(2x^2 - x^3)dx$.

8. Find the rank of the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & 4 \\ 3 & 5 & 7 \end{pmatrix}$.

9. If $A = \begin{pmatrix} 3 & 7 \\ 2 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} -3 & 2 \\ 4 & -1 \end{pmatrix}$ then find C where $2C = A+B$.

10. Define objective function.

Part B

Answer any FIVE questions   **(5 x 8 = 40)**

11. If the demand law is $p = \frac{10}{(x+1)^2}$, find the elasticity of the demand in terms of x.

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. Investigate the maxima and minima of the function $2x^3 + 3x^2 - 36x + 10$.

14. If $y = \sqrt{x+1} + \sqrt{x-1}$, prove that $(x^2 - 1)\frac{d^2y}{dx^2} + x\frac{dx}{dy} = \frac{1}{4}y$.

15. Integrate $\frac{x^3}{(x^2+1)^3}$ with respect to x.

16. Find the inverse of the matrix $A = \begin{pmatrix} 1 & 0 & -4 \\ -2 & 2 & 5 \\ 3 & -1 & 2 \end{pmatrix}$.

17. Find the matrix B if $A = \begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$ and $A + 2B = A^2$.

18. Resolve into partial fractions $\frac{x}{(x-1)(2x+1)}$.

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Part C

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:

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

20. (a) Find the second order partial derivative of $u = 4x^2 + 9xy - 5y^2$.

    (b) If $y = \left(x + \sqrt{1 + x^2}\right)^m$, show that $(1 + x_2)y_2 + xy_1 = m^2 y$.

    (c) If $x\sqrt{1 + y} + y\sqrt{1 + x} = 0$, prove that $\frac{dy}{dx} = \frac{-1}{(1+x)^2}$. **(6+10+4)**

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

    (b) Evaluate $\quad x^2 e^{3x}\, dx$. **(10+10)**

22. (a) Solve the system of the following equations using matrix method.

    $$x + y + z = 7;\ x + 2y + 3z = 16;\ x + 3y + 4z = 22.$$

    (b) Solve the following linear programming problem graphically:

    Maximize $Z = 2x_1 + 5x_2$ Subject to $x_1 + x_2 \le 24, 3x_1 + x_2 \le 21, x_1 + x_2 \le 9$,

    $x \ge 0, y \ge 0$. **(10+10)**

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