LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

U.G. DEGREE EXAMINATION – **ALLIED**

THIRD SEMESTER – **APRIL 2023**

MT 3203 – BUSINESS MATHEMATICS

Date: 12-05-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION A

Answer ALL questions: (10 x 2 = 20)

1. Define total revenue function.
2. Find the equilibrium price by the method of demand given the functions: $Q_d = 50 - \frac{8p}{7}$ and $Q_s = 10 + \frac{2p}{3}$.
3. Find the differential coefficient e^x with respect to x.
4. If $u = x^2y^3z^4 + 6x + 7y + 9z$ find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$.
5. Evaluate $\int (x^2 + x)\, dx$
6. Integrate $\int_0^1 \frac{1}{x^2}\, dx$.
7. Solve $\begin{vmatrix} 2 & 0 & 4 \\ 0 & 1 & 5 \\ 1 & 2 & 0 \end{vmatrix}$.
8. If $A = \begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$, then find A^2.
9. Resolve into partial fractions $\frac{1}{(x+1)(x+2)}$.
10. Define feasible solution of the linear programming problem.

SECTION 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. 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.
13. Differentiate $\frac{(x+1)(2x-1)}{(x-3)}$ with respect to x.
14. If $y = x^{x^x}$, find $\frac{dy}{dx}$.
15. Find the maximum and minimum values of the function $\frac{2}{3}x^3 + \frac{1}{2}x^2 - 6x + 8$.
16. Find consumer's surplus and producer's surplus for the demand curve $D(x) = 16 - x^2$ and the supply curve $S(x) = 4 + x$.
17. Find the adjoint of the matrix $A = \begin{pmatrix} 1 & 4 & 5 \\ 3 & 2 & 6 \\ 0 & 1 & -3 \end{pmatrix}$
18. A manufacturer produces tubes and bulbs. It takes 1 hour of work on machine M and 3 hours of work on machine N to produce one package of bulbs while it takes 3 hours of work on machine M and 1 hour of work on machine N to produce a package of tubes. He earns a profit of Rs 12.50 per package of bulbs and Rs 5 per package of tubes. How many packages of each should he produced each day so as to maximize his profit if he operates the machine for at most 12 hours a day.

SECTION C

Answer any TWO questions: (2 x 20 = 40)

19. 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 $p = a + bx$.
20. (a) If $y = \left(x + \sqrt{1+x^2}\right)^m$, show that $(1+x^2)y_2 + xy_1 = m^2 y$.
    (b) Evaluate $\int x^2 e^{3x} dx$. (10+10)
21. Integrate $\int \frac{3x-2}{\sqrt{4x^2-4x-5}} dx$.
22. (a) Prove that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

    (b) Solve the equations $5x - 6y + 4z = 15; 7x + 4y - 3z = 19; 2x + y + 6z = 46$ by inverse matrix method. (10+10)

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