



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.A. DEGREE EXAMINATION – ECONOMICS

THIRD SEMESTER – NOVEMBER 2017

MT 3204 - BUSINESS MATHEMATICS

Date: 11-15-2017
Time: 01:00-04:00

Dept. No.

Max. : 100 Marks

PART-A

Answer ALL the questions

(10 X 2 = 20)

- 1) Find $3A + 4B + 5I$ when $A = \begin{pmatrix} 2 & 3 \\ -1 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 5 \\ 2 & 4 \end{pmatrix}$.
- 2) Define inverse of a square matrix.
- 3) Find the determinant of A, if $A = \begin{bmatrix} 1 & 0 & -4 \\ -2 & 2 & 5 \\ 3 & -1 & 2 \end{bmatrix}$.
- 4) Differentiate $\sin(\log x)$ with respect to x .
- 5) If profit function is given as $\frac{1}{3}(-2p^2 + 105p - 1000)$, find the price at which profit is maximum.
- 6) Evaluate $\int (4x + 5)^6 dx$.
- 7) When total cost is given by $TC = x^2 + 78x + 2500$, find the average cost and marginal cost.
- 8) Write any two properties of definite integrals.
- 9) Evaluate $\int_6^{10} \frac{1}{x+2} dx$.
- 10) Define objective function.

PART - B

Answer any FIVE questions

(5 X 8 = 40)

- 11) Given the following transaction matrix, find the gross output to meet the final demand of 200 units of Agriculture and 800 units of Industry.

Producing sector	Purchasing sector		Final demand
	Agriculture	Industry	
Agriculture	300	600	100
Industry	400	1200	400

12) If $K = \begin{pmatrix} 6 & 8 & 3 & 4 \\ 5 & 7 & 4 & 5 \\ 8 & 3 & 5 & 1 \end{pmatrix}$ $V = \begin{pmatrix} 18 \\ 20 \\ 24 \\ 35 \end{pmatrix}$ and $W = \begin{pmatrix} 2 & 2 & 1 & 3 \\ 1 & 3 & 1 & 2 \\ 4 & 1 & 2 & 0 \end{pmatrix}$

Matrix K shows the stock of four types of record players R_1, R_2, R_3 and R_4 (in columns) in three shops S_1, S_2 and S_3 (in rows). Matrix V shows the value of the record players in hundred rupees. Matrix W gives the week's sales. Find (a) the stock at the end of the week. (b) the order matrix to bring the stock of each of the cheaper pair of record players to 8 and the dearer pair to 5. (c) the value of the sales, (d) the value of the order.

- 13) Differentiate the following function: (a) by substitution method $\frac{1}{\sqrt{(6x^5 - 7x^3 + 9)}}$

(b) by log differentiation $\frac{x^{1/2}(5-2x)^{2/3}}{(4-3x)^{3/4}(7-4x)^{4/5}}$

14) If $2x = y^{1/4} + y^{-1/4}$, then prove that $(x^2-1) \frac{d^2y}{dx^2} + x \frac{dy}{dx} - 16y = 0$.

15) Evaluate $\int x \tan^{-1}(x) dx$.

16) Find the consumer surplus and producer surplus under pure competition for demand function $p = \frac{8}{x-1} - 2$ and supply function $p = \frac{1}{2}(x+3)$, where p is price and x is quantity.

17) Resolve into Partial fractions: $\frac{9}{(x-1)(x+2)^2}$.

18) Solve graphically: Maximize $Z = 500x + 150y$
 subject to the constraints : $x + y \leq 60$
 $2500x + 500y \leq 50,000$
 $x, y \geq 0$.

PART - C

Answer any TWO questions:

(2 X 20 = 40)

19) (a) To control a certain crop disease it is necessary to use 8 units of chemical A, 14 units of chemical B and 13 units of chemical C. One barrel of spray P contains one unit of A, 2 units of B and 3 units of C. One barrel of spray Q contains 2 units of A, 3 units of B and 2 units of C. One barrel of spray R contains one unit of A, 2 units of B and 2 units of C. How many barrels of each type of spray should be used to control the disease? (12)

(b) Find the rank of the matrix $\begin{bmatrix} -1 & 1 & 1 \\ 1 & -1 & 2 \\ -1 & 1 & 10 \end{bmatrix}$. (8)

20) (a) The total cost function of a firm is given by $C = 0.04x^3 - 0.9x^2 + 10x + 10$ Find (i) Average cost (ii) Marginal cost (iii) Slope of AC (iv) Slope of MC (v) Value of x at which average variable cost is minimum. (10)

(b) the production function of a commodity is given by $Q = 40x + 3x^2 - \frac{x^3}{3}$, where Q is the total output and F is the unit of input.

- (i) Find the number of units of input required to give maximum output.
- (ii) Find the maximum value of marginal product.
- (iii) Verify that when the average product is maximum, it is equal to marginal product. (10)

21) (a) Evaluate $\int \frac{x^2 \tan^{-1} x}{1+x^2} dx$. (10)

(b) The marginal cost of production of a firm is given as $MC = 5 + 0.13x$ and the marginal revenue is $MR = 18$. Also given that $C(0) = \text{Rs. } 120$. Compute the total profit. (10)

22) A firm makes two types of furniture namely chairs and tables. The contribution for each product as calculated by the accounting department is Rs. 20 per chair and Rs. 30 per table. Both products are processed on three machines M, N and O. The time required in hours by each product and total time available in hours per week on each machine are as follows:

Machine	Chair	Table	Available time
M	3	3	36
N	5	2	50
O	2	6	60

How should be the manufacturer schedule his production in order to maximize contribution?
