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Integrated M.A. Programme in Social Sciences (C.S.S) EXAMINATION, MARCH 2024

## **2023 ADMISSIONS REGULAR**

### **SEMESTER II - CORE COURSE ECONOMICS**

### EC02C08IM20 - Mathematics and Marginal Analysis

Time: 3 Hours

Maximum Weight: 30

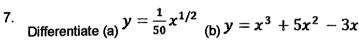
#### Part A

## I. Answer any Eight questions. Each question carries 1 weight

(8x1=8)

- 1. What is quadratic formula? What are the terms included in it?
- 2. What are the differences between linear, non-linear and quadratic equations?
- 3. Draw a diagram to explain the concepts of slope and intercept.
- 4. When the function, y = ax + b, is plotted as a graph, what will happen if a = 0?
- 5.  $\begin{bmatrix} 3 & 4 & 2 \\ 0 & 1 & -3 \\ 2 & -2 & 8 \end{bmatrix}$  is non-singular

6. Find the rank of the following matrix,  $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ .





- 8. Differentiate the function  $y = 10x^2$
- 9. What is meant by relative maximum and relative minimum of a function?
- 10. Graphically illustrate the concepts of concavity and convexity of a function.

### Part B

## II. Answer any Six questions. Each question carries 2 weight

(6x2=12)

- 11. Solve z = x+y+4; z = 2x-y; z = 3x 4y.
- 12. Plot the graph of y = -3x + 2 between x = -3 and x = +3.

13. 
$$A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & 0 & 3 \\ 3 & -1 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 \\ 0 & 2 \\ -1 & 4 \end{bmatrix}$$
 and  $C = \begin{bmatrix} 1 & 2 & 3 & -4 \\ 2 & 0 & -2 & 1 \end{bmatrix}$ , find A (BC), (AB)C and show that A(BC)=(AB)C.

14. 
$$P = \begin{bmatrix} 0 & 1 \\ 2 & 3 \end{bmatrix}$$
,  $Q = \begin{bmatrix} -1 & 2 \\ 4 & 3 \end{bmatrix}$  and  $R = \begin{bmatrix} 2 & -1 \\ 6 & 5 \end{bmatrix}$ , find P(Q+R) and PQ+PR, hence prove P(Q+R) = PQ + PR.

15. Differentiate 
$$y = \frac{5x^2 - 9x + 8}{x^2 + 1}$$

16. Differentiate 
$$y = \frac{15x^2}{2x^2 + 7x - 3}$$

17. Find the marginal and average concepts from the following:

(a) 
$$TC = 3Q^2 + 7Q + 12$$

(b) 
$$TP = 12Q - Q^2$$

18. Discuss the conditions for increasing and decreasing functions.

# III. Answer any Two questions. Each question carries 5 weight

(2x5=10)

- 19. Solve: (i) 2x+4y=14 and 4x-4y=4 (ii) 6a+b=18 and 4a+b=14
- 20. Find the equilibrium price and quantity for the following markets, with the aid of graphs: (a) Qs=-20+3P & Qd = 220-5P (b) Qs+32-7P=0 & Qd-128+9P=0
- 21. Explain the concept of Rank of a matrix. Determine the rank for the following matrices: (a)

$$A = \begin{bmatrix} -3 & 6 & 2 \\ 1 & 5 & 4 \\ 4 & -8 & 2 \end{bmatrix} \quad B = \begin{bmatrix} 5 & -9 & 3 \\ 2 & 12 & -4 \\ -3 & -18 & 6 \end{bmatrix} \quad C = \begin{bmatrix} -8 & 2 & -6 \\ 10 & -2.5 & 7.5 \\ 24 & -6 & 18 \end{bmatrix} \quad D = \begin{bmatrix} 2 & 5 \\ 7 & 11 \\ 3 & 1 \end{bmatrix}$$

22. For each of the following functions, (1) find the second-order derivative and (2) evaluate it at x = 2.

(a) 
$$y=7x^3+5x^2+12$$

(b) 
$$y=x^6 + 3x^4 + x$$

(c) 
$$y = (2x+3)(8x^2-6)$$

