TB242758N

Reg. No :.....

Name :.....

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. Show that $\begin{bmatrix} 3 & 4 & 2 \\ 0 & 1 & -3 \\ 2 & -2 & 8 \end{bmatrix}$ is non-singular.
6. Find the rank of the following matrix, $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$.
7. Differentiate (a) $y = \frac{1}{50}x^{1/2}$ (b) $y = x^3 + 5x^2 - 3x$
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. If $A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & 0 & 3 \\ 3 & -1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ 0 & 2 \\ -1 & 4 \end{bmatrix}$ 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. If $P = \begin{bmatrix} 0 & 1 \\ 2 & 3 \end{bmatrix}$, $Q = \begin{bmatrix} -1 & 2 \\ 4 & 3 \end{bmatrix}$ 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.

Part C

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)**

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

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