TB243642Z

Reg. No :.....

Name :.....

Integrated M.A. Programme (C.S.S) EXAMINATION, NOVEMBER 2024

2023 ADMISSIONS REGULAR

SEMESTER III - CORE COURSE ECONOMICS

EC03C11IM20 - Introductory Mathematical Economics

Time : 3 Hours **Maximum Weight : 30**

Part A

I. Answer any Eight questions. Each question carries 1 weight **(8x1=8)**

1. Find the partial derivatives for $z = 5x^3 - 3x^2y^2 + 7y^5$.
2. What is constrained optimisation?
3. $Q = 20 + 8x + 3x^2 - 0.25x^3 + 5y + 2y^2 - 0.5y^3$, then find marginal productivity of the inputs.
4. Find the marginal productivity of the different inputs or factors of production for $Q=6x^2 + 3xy + 2y^2$.
5. State the condition for increasing returns to scale.
6. State the condition for decreasing returns to scale.
7. Solve $\int (3x^3 - x + 1)dx$.
8. Evaluate $\int 3x^{-1}dx$.
9. Discuss the military applications of LP.
10. Differentiate between a primal and a dual.

Part B

II. Answer any Six questions. Each question carries 2 weight **(6x2=12)**

11. Find the total derivative dz/dx for each of the following functions: (a) $z = 6x^2 + 15xy + 3y^2$ where $y = 7x^2$
    (b) $z = \frac{9x - 7y}{2x + 5y}$ where $y = 3x - 4$
12. Given $Q = 10K^{0.4} L^{0.6}$, (a) find the marginal productivity of capital and labour and (b) determine the effect on output of an additional unit of capital and labour at K = 8, L = 20.
13. Find out the first and second partial derivatives for $q = 5K^{0.4} L^{0.6}$.
14. Comment on the isoquants of a CD production function.
15. Determine the value of the indefinite integral, $\int 12x^2(x^3 + 2)dx$.
16. What is initial or boundary condition? Explain its relevance in integration.
17. Write dual of the following:
    Maximize $p_1x_1+p_2x_2$, subject to the constraints $a_{11}x_1+a_{11}x_2 \leq b_1$; $a_{21}x_1+a_{22}x_2 \leq b_2$; $x_1, x_2 \geq 0$.
18. Minimize $30x_1+50x_2$, subject to $6x_1+2x_2 \geq 30$; $3x_1+2x_2 \geq 24$; $5x_1+10x_2 \geq 30$; x_1 and $x_2 \geq 0$.

Part C

III. Answer any Two questions. Each question carries 5 weight **(2x5=10)**

19. For each of the following quadratic functions, (1) find the critical points at which the function may be optimized and (2) determine whether at these points the function is maximized, is minimized, is at an inflection point, or is at a saddle point.
    (a) $z = 3x^2 - xy + 2y^2 - 4x - 7y + 12$

(b) $f(x, y) = 60x + 34y - 4xy - 6x^2 - 3y^2 + 5$

20. Find the critical values for minimizing the costs of a firm producing two goods x and y when the total cost function is $\mathbf{c = 8x^2 - xy + 12y^2}$ and the firm is bound by contract to produce a minimum combination of goods totalling 42, that is, subject to the constraint $\mathbf{x + y = 42}$.
21. Examine the major properties of CD production function.
22. Show $\int_{-4}^{4}(8x^3 + 9x^2)\,dx = \int_{-4}^{0}(8x^3 + 9x^2)\,dx + \int_{0}^{4}(8x^3 + 9x^2)\,dx$.