TB213660V **Reg. No :...............................**

Name :.................................

INTEGRATED M.A . PROGRAMME IN SOCIAL SCIENCES - ECONOMICS EXAMINATION, NOVEMBER 2022

(2021 Admission 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 critical points for the function, $z= 2y^3 - x^3+147x - 54y+12$.
2. What are multivariable functions?
3. Define income elasticity of demand.
4. If total cost function is given as, $c = 3x^2 + 7x + 1.5xy + 6y + 2y^2$, determine the marginal cost of x when x = 5, y= 3.
5. Determine the level of homogeneity and returns to scale, for the production function, $Q=x^2 + 6xy+7y^2$.
6. State and explain Cobb-Douglas Production function.
7. Solve $\int(3x^3 - x + 1)dx$.
8. Solve $\int 9e^{-3x}dx$.
9. Explain how LP is useful in Personnel management.
10. Explain the role of LP in financial management.

Part B

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

11. Find the (a) first, (b) second, and (c) cross partial derivatives for $z=7x^3 + 9xy + 2y^5$
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. Interpret the meaning of constant A, exponents α and β in a Cobb-Douglas production function.
14. Compute the marginal product of capital and labour in a Cd production function.
15. Compute $\int_5^5 (2x + 3)\, dx.$
16. Evaluate $\int_1^3 2x^3\, dx.$
17. Write dual of the following:
    Minimize 20x+30y+40z, subject to the constraints, x+y≥10; y+z≥20, x+z≥30 and x, y, z ≥0.
18. A tailor has 80 metres of cotton and 120 metres of wool with him. If suit requires 1 metre cotton and 3 metres of wool and dress requires 2 metres of cotton and 2 metres of wool, how many of each garment to be produced if each product sells for Rs. 30? Mark the feasible region in graph.

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. A producer offers two different brands of a product, for which the demand functions are **$Q_1 = 14 - 0.25P_1$; $Q2 = 24 - 0.5P_2$**. The joint cost function is $TC = Q_1^2 + 5Q_1Q_2 + Q_2^2$. Determine the profit-maximizing level of output, the price that should be charged for each brand, and the profits.
21. If in a linearly homogeneous CD production function, each of the input is paid by the amount of its marginal product, find out the share of total product accruing to capital and labour.
22. Integrate the following definite integral by means of the substitution method: $\int_0^3 \frac{6x}{(x^2+1)}\, dx.$