D4AEC2004 **(4 Pages)** **Name.....**

Reg. No.....

FOURTH SEMESTER M.A DEGREE EXAMINATION, APRIL 2022

(Regular/Improvement/Supplementary)

ECONOMICS

FECO4E03 - MATHEMATICAL ECONOMICS

Time: 3 Hours **Maximum Weightage: 30**

Part A: Multiple choice questions. Answer *all* questions. Each carries $^1/_5$ weightage.

1. Expansion path of Cobb Douglas production function is a
   (a) straight line (b) straight line through the origin
   (c) parabola (d) hyperbola
2. U = f(q_1, q_2) is the utility function, where $f_1 = \frac{\partial u}{\partial q_1}$; $f_2 = \frac{\partial u}{\partial q_2}$ then MRS is given by
   (a) $\frac{f_1}{f_2}$ (b) $f_1 - f_2$
   (c) $f_1 + f_2$ (d) none of these
3. Which of the following statements are (in general) true?
   (a) Marginal cost (MC) is minimised where MC = Average Variable Cost (AVC)
   (b) Average Total Cost (ATC) is minimised where MC = ATC
   (c) Average Variable Cost (AVC) is minimised where MC = AVC
   (d) Total revenue is maximised where MC = Marginal Revenue (MR)
4. For the function $Q = AK^{\alpha}L^{\beta}$ which of the following statements are true?
   (a) $\partial Q/\partial L = A\beta K^{\alpha}L^{\beta-1}$ (b) Marginal Product of Labour = $A\alpha K^{\alpha-1}L^{\beta}$
   (c) Marginal Product of Capital = $\alpha(Q/L)$ (d) $MRTS_{LK} = \frac{dK}{dL}$
5. When $U = f(X)$ is the utility function, diminishing marginal utility is implied by
   (a) $\frac{d^2U}{dX^2} = 0$ (b) $\frac{d^2U}{dX^2} > 0$
   (c) $\frac{d^2U}{dX^2} \geq 0$ (d) $\frac{d^2U}{dX^2} < 0$
6. Dual of a dual problem is
   (a) primal problem (b) diet problem
   (c) dual problem (d) transportation problem

(P.T.O.)

7. The capital coefficient is included in

   (a) dynamic input-output model (b) static input-output model

   (c) closed input-output model (d) open input-output model

8. Which of the following statements is correct with regard to the theory of revealed preference?

   (a) it infers a consumer's preferences from that person's market choices

   (b) it can be used to derive a consumer's indifference curve

   (c) it can be used to derive consumer's demand curve

   (d) all of the above

9. A downward sloping straight line indifference curve represents

   (a) Perfect substitutes (b) Perfect complements

   (c) Normal goods (d) Inferior goods

10. Which of the following functions are homogeneous of degree 1 (i.e. linear homogeneous)?

    (a) $Q = 100\ K^{1/4}\ L^{3/4}$ (b) $Q = 20\ K^{\alpha}L^{1-\alpha}$

    (c) $Q = (K^2 + 2KL + L^2)^{1/2}$ (d) All the above

11. A necessary condition for profit maximization is

    (a) MC = P (b) MC = MR

    (c) MC = AR (d) None of these

12. The nature of the demand curve under perfect competition is

    (a) perfectly inelastic (b) perfectly elastic

    (c) highly elastic (d) highly inelastic

13. Simplex method was developed by

    (a) Leontief (b) Walras

    (c) Giffen (d) Dantzig

14. An input-output model without exogenous sector is called

    (a) closed model (b) open model

    (c) dynamic model (d) static model

15. Under perfect competition $\frac{dp}{dq}$ is

    (a) positive (b) negative

    (c) zero (d) infinite

($15 \times {}^{1}/_{5} = 3$ weightage)

Part B: Answer any *five* questions. Each carries *one* weightage.

16. Compute marginal utility of x and y at x = 1 and y = 2 for the utility function $U = 3x^2y + 4xy^2 + 2x + 2y$.
17. Discuss the Linear Expenditure System.
18. What is minimax criterion?
19. Determine the degree of homogeneity of the production function $f(xy) = 3x^3 + 5xy^2 + y^3$ and comment on the nature of the returns to scale.
20. If $R = 32q - q^2$, find the output at which revenue is maximum.
21. Examine the equilibrium condition in a monopoly market.
22. Write a short note on Hawkin Simon conditions.
23. What is mixed strategy?

(5 × 1 = 5 weightage)

Part C: Answer any *seven* questions. Each carries *two* weightage.

24. Explain the conditions of maximization of the ordinal utility of a consumer subject to a budget constraint.
25. Derive the Slutsky demand equation of a consumer with a two commodity and fixed income budget.
26. Distinguish between direct and indirect utility functions.
27. Find solutions of game theory problem using Saddle point.

Player A \ Player B	B_1	B_2	B_3
A_1	-2	14	-2
A_2	-5	-6	-4
A_3	-6	20	-8

28. For the Cobb Douglas production function $q = A\ K^{\propto}L^{1-\propto}$
    (a) show that the elasticity of substitution between K and L is unity
    (b) prove that it satisfies Euler's theorem.
29. The total cost function is $C = 4q - q^2 + 2q^3$. Find the quantity produced for a minimum average cost. Verify that at this point AC = MC.
30. Given the demand function and total cost function of the competitive firm as $P = 32 - Q$ and $C = Q^2 + 8Q + 4$. What level of output will maximize profit? Determine the level of profit at that level of output.

(P.T.O.)

31. What are compensated demand functions? How are they derived from the utility function $U = q_1q_2$.
32. What are the various methods for incorporation of risk factor?
33. Solve the following Linear Programming Problem by Graphical method

    Maximise $\pi = 40x_1 + 30x_2$

    Subject to $x_1 \leq 16$

    $x_2 \leq 8$

    $x_1 + 2x_2 \leq 24$

    And $x_1, x_2 \geq 0$

(7×2 = 14 weightage)

Part D: Answer any *two* questions. Each carries *four* weightage.

34. State and prove the properties of CES production function.
35. The cost function for a discriminating monopolist is given by $C = 2q^2 – 5q + 3$, where q is total output (that is, $q = q_1 + q_2$). The demand for its product in its two markets is $p_1 = 8 – 5\ q_1$ and $p_2 = 7 – 2\ q_2$. Find the firm's profit maximizing output in each market, the price it will charge in each market and the amount of overall profit it will make.
36. Estimate the output of three industries given input coefficient matrix and final demand as follows:

    $A=\begin{bmatrix} 0.1 & 0.3 & 0.1 \\ 0 & 0.2 & 0.2 \\ 0 & 0 & 0.3 \end{bmatrix}$ and $D = \begin{bmatrix} 20 \\ 0 \\ 100 \end{bmatrix}$
37. Solve the following linear programming problem by simplex method

    Maximize $Z = 30x_1 + 50x_2$

    subject to

    $2x_1 + x_2 \leq 16$

    $x_1 + 2x_2 \leq 11$

    $x_1 + 3x_2 \leq 15$

    and $x_1, x_2, \geq 0$.

(2 × 4 = 8 weightage)