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Name.....

Reg. No.....

**FOURTH SEMESTER M.A. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, APRIL 2026**

(CBCSS)

Economics

ECO 4E 09—MATHEMATICAL ECONOMICS

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

Part A (Multiple Choice Questions)*Answer all fifteen questions.*

1. A firm maximizes profit when marginal cost (MC) is equal to :
 - (A) Average cost.
 - (B) Total cost.
 - (C) Marginal revenue.
 - (D) Average revenue.
2. Shepherd's lemma is used to derive :
 - (A) The cost function from the production function.
 - (B) The production function from the cost function.
 - (C) The demand function from the supply function.
 - (D) The input-output matrix.
3. In the context of production functions, technological progress leads to :
 - (A) An increase in the elasticity of substitution.
 - (B) A decrease in the elasticity of substitution.
 - (C) A shift in the production function.
 - (D) A decrease in output.

Turn over

4. The elasticity of a production function measures :
- (A) How inputs are substituted for each other.
 - (B) How output changes in response to input changes.
 - (C) The price sensitivity of inputs.
 - (D) The cost of production.
5. The marginal rate of technical substitution (MRTS) is a measure of :
- (A) How inputs are combined at the optimal point.
 - (B) The change in output due to a change in input prices.
 - (C) The elasticity of substitution between inputs.
 - (D) The rate at which technology improves.
6. In producer's equilibrium, a firm maximizes profit when :
- (A) Marginal cost equals marginal revenue.
 - (B) Marginal cost is at its minimum point.
 - (C) Total cost is minimized.
 - (D) Average total cost is minimized.
7. An isoquant represents :
- (A) All the combinations of inputs that produce a given output.
 - (B) The relationship between input prices and input quantities.
 - (C) The optimal input combination for a given level of output.
 - (D) The producer's budget constraint.
8. In the context of a utility-maximizing consumer, what is the goal when choosing a combination of goods and services ?
- (A) Maximize total cost.
 - (B) Maximize total revenue.
 - (C) Maximize total utility.
 - (D) Minimize total utility.

9. In a competitive market, equilibrium is reached when :
- (A) Demand exceeds supply.
 - (B) Supply exceeds demand.
 - (C) Quantity demanded equals quantity supplied.
 - (D) Prices are constantly changing.
10. If the demand function in a market is given as $Q_d = 100 - 2P$ and the supply function is $Q_s = 20P$, what is the equilibrium price ?
- (A) \$10.
 - (B) \$20.
 - (C) \$30.
 - (D) \$40.
11. The area between the demand and supply curves below the equilibrium price. What does it represent ?
- (A) Producer surplus.
 - (B) Consumer surplus.
 - (C) Deadweight loss.
 - (D) Total revenue.
12. If the equilibrium price is \$ 20 and the price ceiling is set at \$ 15, what will be the consequence ?
- (A) Shortage.
 - (B) Surplus.
 - (C) Equilibrium.
 - (D) No change.
13. If the equilibrium price is \$30 and the price floor is set at \$ 40, what will be the consequence ?
- (A) Shortage.
 - (B) Surplus.
 - (C) Equilibrium.
 - (D) No change.
14. If the percentage change in quantity supplied is greater than the percentage change in price, supply is considered :
- (A) Elastic.
 - (B) Inelastic.
 - (C) Unitary elastic.
 - (D) Perfectly elastic.

Turn over

15. The break-even point for a firm occurs when :

- (A) Total revenue equals total cost.
- (B) Total revenue exceeds total cost.
- (C) Total cost is minimized.
- (D) Total profit is maximized.

(15 × 1/5 weightage = 3 Weightage)

Part B (Very Short Answer Questions)

*Answer any **five** questions out of eight questions.*

16. Define income elasticity of demand.

17. What is Roy's identity ?

18. What do you mean by cost function ?

19. Define pure strategy.

20. What is dual problem ?

21. Determine the level of homogeneity for the following production function $Q = x^2 + 6xy + 7y^2$.

22. Determine the returns to scale of the following function :

$$Q = 0.9K^{0.2}L^{0.6}.$$

23. Find the marginal productivity of the different inputs or factors of production for each of the following production Q :

$$Q = 6x^2 + 3xy + 2y^2.$$

(5 × 1 = 5 weightage)

Part C (Short Answer Questions)

*Answer any **seven** questions out of ten questions.*

24. What do you mean by homothetic utility function ? Explain.

25. Write a brief note on linear expenditure systems.

26. Briefly discuss the technological progress function.
27. What is simplex solution ? Explain.
28. Briefly discuss the mathematical treatment of equilibrium under monopoly.
29. Explain the two-person zero-sum game
30. Given $Q = 700 - 2P + 0.02Y$, where $P = 25$ and $Y = 5000$. Find the income elasticity of demand.
31. 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 $K = 8$, $L = 20$.
32. Given the demand for beef :

$$Q_b = 4850 - 5P_b + 1.5 P_p + 0.1Y.$$

With $Y = 10,000$, $P_b = 200$, and the price of pork $P_p = 100$. Find the cross elasticity of demand for beef.

33. (a) Find the marginal cost of a firm's different products when the total cost function is :

$$c = 3x^2 + 7x + 1.5xy + 6y + 2y^2.$$

- (b) Determine the marginal cost of x when $x = 5$, $\bar{y} = 3$.

(7 × 2 = 14 weightage)

Part D (Essay Questions)

Answer any **two** questions out of four questions.

34. Elaborate the application of linear programming in economics.
35. Explain the input output analysis.
36. Find the profit maximising level of : (a) Output ; (b) Price ; and (c) Profit for the monopolistic producer with the demand functions :

$$Q_1 = 49 \frac{1}{3} - \frac{2}{3}P_1$$

$$Q_2 = 36 - \frac{1}{2}P_2 \text{ and the joint cost function } c = Q_1^2 + 2Q_1Q_2 + Q_2^2 + 120.$$

Turn over

37. Optimize the following Cobb-Donglas production functions subject to the given constraints by :

(a) Forming the Lagrange function ; and (b) Finding the critical values :

(i) $q = K^{0.3} L^{0.5}$ subject to $6K + 2L = 384$.

(ii) $q = 10K^{0.7} L^{0.1}$, given $P_K = 28$, $P_L = 10$ and $B = 4,000$.

(4 × 2 = 8 weightage)