

**FOURTH SEMESTER M.A. DEGREE EXAMINATION, APRIL 2022**

(CBCSS—SDE/Private)

Economics

ECO 4E 09—MATHEMATICAL ECONOMICS

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

**Part A (Multiple Choice Questions)***Answer all questions.**Each question carries 1/5 weightage.*

1. The cost function  $C = f(Q)$  is strictly monotonically increasing if :
  - (a)  $f'(Q) = 0$ .
  - (b)  $f'(Q) > 0$ .
  - (c)  $f'(Q) < 0$ .
  - (d)  $f'(Q) \leq 0$ ;  $f'(Q)$  is the first derivative.
2. The total cost as a function of output can be expressed by using :
  - (a) Production function.
  - (b) Cost equation.
  - (c) Expansion path.
  - (d) All of the above.
3. Given the marginal cost of production,  $MC = 2Q$  a competitive firm is in equilibrium at unit price Rs. 20 when the level of output  $Q$  is :
  - (a) Less than 10.
  - (b) More than 10.
  - (c) Less than or equal to 10.
  - (d) Equal to 10.
4. The marginal rate of substitution of  $x$  for  $y$  for the utility function  $xy - k = 0$ , the is :
  - (a)  $dy/dx$ .
  - (b)  $-dy/dx$ .
  - (c)  $dx/dy$ .
  - (d)  $-dx/dy$ .

5. Which of the following production functions is homogeneous ?
- (a)  $z = x + xy - y.$  (b)  $z = x^2 + xy - y^2.$
- (c)  $z = x^2 + x^2y - y^2.$  (d)  $z = x^2 + x^2y^2 - y^2.$
6. When the cross-partials of utility function are all zero the utility function is :
- (a) Additive (b) Homogenous
- (c) Multiplicative (d) Separable
7. The Cobb-Douglas production function  $Q = Ax_1^a x_2^b$ , where  $x_1$  and  $x_2$  are inputs,  $Q$ , the output,  $A$ ,  $a$  and  $b$  are parameters, reflects decreasing returns to scale when :
- (a)  $a + b = 1.$  (b)  $a + b < 1.$
- (c)  $a + b > 1.$  (d)  $a + b > 0.$
8. The expansion path is straight line for a production of homogeneous of degree :
- (a) One. (b) More than one.
- (c) Less than one. (d) Any degree.
9. When the elasticity of substitution,  $\sigma = 1$ , the isoquant is :
- (a) Rectangular hyperbola. (b) Hyperbola.
- (c) Parabola. (d) Linear.
10. Marginal productivity theory of distribution makes use of :
- (a) Slutsky's theorem. (b) Chebyshev's theorem.
- (c) Euler's theorem. (d) Leibnitz theorem.
11. Which of the following relations between AR and MR is true when the demand curve of a monopolist has unitary elasticity at a point ?
- (a)  $MR = AR.$  (b)  $MR < AR.$
- (c)  $MR > AR.$  (d)  $MR \geq AR.$

12. When the optimal solution of the primal programming problem is ( $p$ ) and of the dual programme is ( $d$ ), which of the following is valid about the solution ?
- (a)  $p < d$ . (b)  $p > d$ .  
(c)  $p = d$ . (d)  $p \neq d$ .
13. If an input-output system in  $m$  industries contains one or more self-sufficient groups then the system is called :
- (a) Open. (b) Composite.  
(c) Closed. (d) Decomposable.
14. The specification of particular move for the participants in a game is called :
- (a) Pay-off. (b) Strategy.  
(c) Value of the game. (d) Bargaining.
15. Prisoner's dilemma is a classic example of :
- (a) Zero-sum game. (b) Non-zero-sum game.  
(c) Competitive game. (d) Co-operative game.

(15 × 1/5 = 3 weightage)

**Part B (Very Short Questions)**

*Answer any five questions.*

*Each question carries a weightage of 1.*

16. Distinguish between ordinary demand function and compensated demand function.
17. Explain homothetic production function.
18. State the properties of ordinary demand function.
19. What is zero-sum game ?
20. Distinguish between direct and indirect utility function.
21. State any *two* duality theorems of linear programming.

Turn over

22. Find the equilibrium price when the demand and supply curves are respectively :

$$Q_d = 250 - 50p \text{ and } Q_s = 33.3p.$$

23. State the assumptions of input-output analysis.

(5 × 1 = 5 weightage)

### Part C (Short Answer Questions)

Answer any **seven** questions.

Each question carries 2 weightage.

24. Given the elasticity of substitution  $\sigma = 1/(1 + \rho)$  of the CES production function discuss various types of isoquants on the basis of the value of  $\rho$ .
25. The demand function is  $Q_1 = aP_1^{-1} bP_2^{0.6}M^{0.5}$  where  $P_1, P_2$  are prices and  $M$  income obtain own price ( $e_{11}$ ), cross price ( $e_{12}$ ), and income elasticity of demand ( $e_{1M}$ ). How do you interpret the result?
26. Given the demand curve faced by a monopolist  $Q = \alpha - \beta P$  find the marginal revenue and the average revenue when  $Q = 1$ .
27. What do you mean by technological viability? Examine the Hawkins-Simons conditions for technological viability of an input-output system.
28. State and explain the minimax theorem in relation to game theory.
29. State Euler's theorem. Verify Euler's theorem for the function,  $W = x^\alpha y^\beta z$ .
30. Explain linear expenditure system.
31. Examine the concept of linkages with reference to input-output analysis.
32. Explain the features of linear programming problem.
33. Define expansion path. Show that the expansion path of homogeneous production function is linear.

(7 × 2 = 14 weightage)

**Part D (Essay Questions)**

*Answer any two questions.*

*Each question carries 4 weightage.*

34. Given the production function  $Q = Ax^a y^b$  where  $A$ ,  $a$  and  $b$  are parameters and  $a + b = 1$ , show that the elasticity of substitution  $\sigma = 1$ .
35. Explain how the structural co-efficient matrix of an input-output system helps predict the gross output in an economy given the final demand vector.
36. State and explain the properties of Cobb-Douglas Production function.
37. State the relationship between primal and dual programming problem.

(2 × 4 = 8 weightage)