

FOURTH SEMESTER M.A. DEGREE EXAMINATION, MARCH 2020

(CUCSS)

Economics

ECO 4C 25—MATHEMATICAL ECONOMICS

Time : Three Hours

Maximum : 36 Weightage

Part A

*Answer all questions.**Each bunch of four questions carries a weightage of 1.*

1. The input demand functions, with respect to input prices are homogeneous of degree :
 - (a) Zero.
 - (b) More than one.
 - (c) One.
 - (d) Less than one.
2. In the case of utility maximisation the Lagrange multiplier can be interpreted as the Marginal utility of :
 - (a) Prices.
 - (b) Income.
 - (c) Commodities.
 - (d) None of the above
3. The statement that the consumer prefers A to B and B to C, she will prefer A to C implies that the preference ordering is :
 - (a) Complete.
 - (b) Transitive.
 - (c) Symmetric.
 - (d) Reflexive.
4. The sum of income elasticities weighted by total expenditure proportions equals :
 - (a) More than one.
 - (b) Less than one.
 - (c) One.
 - (d) Infinity.
5. It is sometimes possible to go from demand functions to the indirect utility function by using :
 - (a) Shephard's lemma.
 - (b) Euler's theorem
 - (c) Roy's identity.
 - (d) Leibnitz theorem.
6. The slope of product transformation curve is :
 - (a) Negative.
 - (b) Positive.
 - (c) Zero.
 - (d) Non-negative.

Turn over

7. Equality of input price and output price times marginal products as a condition for profit maximisation is valid under :

- (a) Monopoly. (b) Perfect competition.
(c) Duopoly. (d) Monopsony.

8. Which of the following functions is omitted from the input output analysis ?

- (a) Production function. (b) Cost function.
(c) Utility function. (d) Demand function.

9. A game in which $t : e$ participants have interest in joint behaviour is :

- (a) Non-co-operative game. (b) Co-operative game.
(c) Competitive game. (d) Symmetric game.

10. The feasible point set for a linear programming system is :

- (a) Closed and convex.
(b) Open and convex.
(c) Closed.
(d) Closed, convex and bounded from below

11. As the elasticity of substitution $\sigma \rightarrow 0$, $\rho \rightarrow +\infty$ the CES production function becomes :

- (a) Cobb-Douglas. (b) VES.
(c) Translog. (d) Leontief.

12. In the presence of external economies the aggregate supply function has slope which is :

- (a) Positive. (b) Negative.
(c) Zero. (d) Non-negative.

(12 × ¼ = 3 Weightage)

Part B

Answer any five questions.

Each question carries a weightage of 1.

13. What are ridge lines ? Explain.
14. Define elasticity of substitution, σ . Find σ when $Q = KL$.
15. What is output expansion path ? Find expansion path of the production function $Q = x_1 x_2$ when the input prices are r_1 and r_2 .
16. What is homothetic production function ?
17. What is saddle point in game theory ?
18. Explain structural coefficient matrix in an input output table.
19. What do you mean by derived demands ?
20. Define zero-sum game ?

(5 × 1 = 5 weightage)

Part C

Answer any eight questions.

Each question carries a weightage of 2.

21. Express the elasticity form of Slutsky equation for two goods and interpret the result.
22. State the duality theorems that connect the production function and cost function.
23. Show that marginal product, MP and average product, AP are equal at the point of maximum AP.
24. What is indirect utility function ? How do you derive goods' demand function from indirect utility function ? Explain.
25. Obtain the compensated demand function for two goods given the utility function $U^o = q_1 q_2$ and the budget constraint, $M = p_1 q_1 + p_2 q_2$.
26. Given the production function $q = Ax_1^2 x_2^2$ obtain average product, marginal product and output elasticity coefficients.
27. Given the total cost function $C = 0.2q^3 - 0.16q^2 + 30q$, find the level of total cost at the output that minimises average cost?
28. Specify a translog production function. In what sense it is called a general form production function ?
29. What is technological viability ? Verify Hawkins-Simons conditions for technological viability for

the structural coefficient matrix $A = \begin{bmatrix} 0.2 & 0.1 & 0.3 \\ 0.1 & 0.5 & 0.2 \\ 0.3 & 0.1 & 0.6 \end{bmatrix}$.

Turn over

30. What is homogeneity of production function ? Verify the degree of homogeneity of the production function, $q = AK^{0.2}L^{0.5} + BK^{0.4}L^{0.3}$.
31. Given the revenue curve, $R - pq$ show that marginal revenue is related to average revenue and price elasticity of demand.

(8 × 2 = 16 weightage)

Part D

*Answer any three questions.
Each question carries a weightage of 4.*

32. Derive Slutsky equation for two-good model and interpret the result.
33. Show that the elasticity of substitution σ for CES production function is other than unity.
34. The Structural coefficient matrix and final demand vector of a three sector hypothetical economy are given in the table below :

Coefficient Matrix, A			Final Demand, D
0.3	0.33	0.14	5
0.4	0.25	0.19	12
0.28	0.3	0.4	10

Find the gross output vector, X. What would be the gross output generated by each industry when the final demand, D from the first sector increased to 10 assuming that coefficients of production remain stable ?

35. The demand and supply relations of a three-good market in terms of their prices are given by :
- $$11 = 2P_1 + 3P_2 + P_3$$
- $$13 = 3P_1 + 2P_2 + 2P_3 ;$$
- $$9 = 4P_1 + P_2 + P_3$$

Find the vector of prices when market is in equilibrium.

36. Given the cost function $C = k(r_1^\alpha r_2^\beta q)^{\frac{1}{\alpha+\beta}}$, where r_1 and r_2 are prices of inputs x_1 and x_2 , k , α and β are parameters, derive input demand functions for x_1 and x_2 using Shephard's lemma.

(3 × 4 = 12 weightage)