2019/TDC/EVEN/ECOHC–202T/061

TDC (CBCS) Even Semester Exam., 2019

ECONOMICS

(2nd Semester)

Course No. : ECOHCC–202T

(Mathematical Methods in Economics—II)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

UNIT—I

1. Answer any *two* of the following questions : 2×2=4

(a) Define differential equations.

(b) Write the general solution of differential equation of the form

$$\frac{dy}{dx} + ay = b$$

(c) Solve the following equation :

$$\frac{dy}{dx} = ae^{y}$$

2. Solve the following equations : 3+3+4=1[illegible]

(a) $y(1-x)-x\frac{dy}{dx}=0$

(b) $\frac{dy}{dx}+3x^2y=3x^2$

(c) $2xdy+\frac{2}{3}ydx=0$

OR

3. (a) The demand and supply functions, when p is the price, Q_d is quantity demanded and Q_s is the quantity supplied, are given as

$$Q_d=a-bp \qquad (a, b>0)$$
$$Q_s=-c+dp \qquad (c, d>0)$$
$$\frac{dp}{dt}=\alpha(Q_d-Q_s), \qquad (\alpha>0)$$

Analyze the market model for stability.

(b) Solve $\frac{d^2y}{dx^2}-7\frac{dy}{dx}+12y=0$.

UNIT—II

4. Answer any *two* of the following questions : 2×2[illegible]

(a) Define idempotent matrix.

(b) What is linear transformation?

(c) Find the following determinant's value :

$$\begin{vmatrix} a-b & a+b \\ a+b & a-b \end{vmatrix}$$

5. (a) If

$$A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$$

find $A^2 - 5A + 7I$. 4

(b) Evaluate : 3

$$A = \begin{vmatrix} 2 & 3 & 1 \\ 3 & 4 & 2 \\ 2 & 0 & 2 \end{vmatrix} = 0$$

(c) Prove that if

$$A = \begin{bmatrix} 2 & 8 \\ 4 & 10 \end{bmatrix}$$

then $A^{-1} = \begin{bmatrix} -\frac{10}{12} & \frac{8}{12} \\ \frac{4}{12} & -\frac{2}{12} \end{bmatrix}$ 3

OR

6. (a) Using matrix inversion, solve the following linear system of simultaneous equations : 4

$$y - 2x = 6$$
$$y + 4x = 18$$

(b) Solve the following linear market model by using Cramer's rule : 6

$$Q_d = 50 - 2p$$
$$Q_s = -10 + 3p$$
$$Q_d = Q_s$$

UNIT—III

7. Answer any *two* of the following questions : 2×2

(a) Define differentiable function.

(b) Find the total differential of $z = \sqrt{x+y}$.

(c) If $u = (ax_1 + bx_2 + c\sqrt{x_1 x_2})$, find $\frac{\partial u}{\partial x_1}$.

8. (a) Solve the following functions :

(i) Given $y = 4x_1 x_2 + x_1^2$ where $x_1 = 3x_2 + 5$, find out total derivative $\frac{dy}{dx_2}$.

(ii) If the utility function is

$$u = \log(ax_1 + bx_2 + c\sqrt{x_1 x_2})$$

obtain the ratio of marginal utilities.

(b) Given $z = x^3 e^{2y}$. Find all the partial derivatives of second order.

OR

9. (a) What is homogeneous function? 3

(b) Given the function $u = Ax^b y^c$; A, b and c are constants.

(i) Find the conditions under which this is a linear homogeneous function. 3

(ii) Apply Euler's theorem if these conditions hold true. 4

UNIT—IV

10. Answer any *two* of the following questions : $2\times2=4$

(a) Given the function $z = f(x, y)$, mention the first and second order conditions for maximization.

(b) Mention the geometric definition of concavity and convexity for a two-variable function $z = f(x_1, x_2)$.

(c) Define quasiconvex function.

11. (a) Mention the first and second order characterization of convex function with more than one explanatory variable. 2

(b) Derive the first and second order conditions in order to show that indifference curve is negatively sloped and convex to the origin taking the utility function

$$u = f(x, y)$$

where, u = total utility. x and y are the quantities of two commodities. 8

OR

12. (a) How to construct Lagrange function? 2

(b) A producer desires to minimize his cost of production $C = 2L + 5K$, where L and K are the inputs, subject to the satisfaction of the production function $Q = LK$. Find the optimum combination of L and K in order to minimize cost of production when output is 40. 8

UNIT—V

13. Answer any *two* of the following questions : 2×2=4

(a) Define input coefficient matrix.

(b) Mention Hawkins-Simon conditions.

(c) Write the economic meaning of $\sum_{i=1}^{n} a_{ij} < 1$ in Leontief static open model.

14. *(a)* Given $\begin{bmatrix} 0\cdot1 & 0\cdot3 & 0\cdot1 \\ 0 & 0\cdot2 & 0\cdot2 \\ 0 & 0 & 0\cdot3 \end{bmatrix}$

(i) What will be the output levels if $F_1 = 20$, $F_2 = 0$ and $F_3 = 100$? 6

(ii) Also obtain gross value added in each sector. 4

OR

15. *(a)* Prove that in a closed Leontief system, the absolute levels of output are indeterminate. 6

(b) Mention the limitations of input-output analysis. 4

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