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

$$\frac{dy}{dx} \quad ay \quad b$$

(c) Solve the following equation :

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

2. Solve the following equations : 3+3+4=10

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

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

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

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

$$Q_d \quad a \quad bp \qquad (a, b \quad 0)$$
$$Q_s \quad c \quad dp \qquad (c, d \quad 0)$$
$$\frac{dp}{dt} \quad (Q_d \quad Q_s) \quad (\quad 0)$$

Analyze the market model for stability. 6

(b) Solve $\frac{d^{2}y}{dx^{2}} \quad 7\frac{dy}{dx} \quad 12y \quad 0.$ 4

UNIT—II

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

(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

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

find $A^2 \quad 5A \quad 71$. 4

(b) Evaluate : 3

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

(c) Prove that if

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

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

OR

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

$$y \quad 2x \quad 6$$
$$y \quad 4x \quad 18$$

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

$$Q_d \quad 50 \quad 2p$$
$$Q_s \quad 10 \quad 3p$$
$$Q_d \quad Q_s$$

UNIT—III

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

(a) Define differentiable function.

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

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

8. *(a)* Solve the following functions :

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

(ii) If the utility function is

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

obtain the ratio of marginal utilities. 3

(b) Given $z \quad x^3 e^{2y}$. Find all the partial derivatives of second order. 5

OR

9. *(a)* What is homogeneous function? 3

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

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

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

UNIT—IV

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

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

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

(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

$$u \quad f(x, y)$$

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 $C \quad 2L \quad 5K$, where L and K are the inputs, subject to the satisfaction of the production function $Q \quad LK$. 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

$$\begin{matrix} 0 & 1 & 0 & 3 & 0 & 1 \\ 0 & & 0 & 2 & 0 & 2 \\ 0 & & 0 & & 0 & 3 \end{matrix}$$

(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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