2019

ECONOMICS — HONOURS

Paper : CC-2

Full Marks : 65

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group - A

1. Answer *any ten* questions :

   (a) In each of the following, state the domain of the function :   1+1

   (i) $y = \sqrt{25 - x^2}$

   (ii) $y = \dfrac{(x-2)}{(x-3)\,(x+4)}$

   (b) Evaluate $\displaystyle\int_{1}^{2} (e^x - 1)e^x \, dx$.   2

   (c) Use Cramer's rule to solve the system of equations :   2

   $$6x_1 + 5x_2 = 49$$
   $$3x_1 + 4x_2 = 32$$

   (d) Let $A = \begin{bmatrix} 4 & 1 \\ 9 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 0 \\ 7 & 1 \end{bmatrix}$ be two matrices. Show that the transpose of the sum of the matrices

   is the sum of the transposes of A and B.   2

   (e) Let $y = f(x) = x^2 + x - 12$, $x > 0$ denote a Total function. Sketch the graph.   1+1

   (f) From the following total cost TC function,

   $$TC = Q^3 - 5Q^2 + 60Q$$

   find the minimum average cost.   2

Please Turn Over

(g) Find the value of the following two person zero-sum game with the help of maximin-minimax principle : 2

Strategies	Player II		
		C	D
Player I	A	0	2
	B	-2	5

(h) Use Jocobian determinant to test the existence of functional dependence between the paired functions : 2

$$y_1 = 3x_1^2 + 2x_2^2$$

$$y_2 = 5x_1 + 1$$

(i) Is the following function strictly convex? 2

$$y = 8 - 5x + x^2$$

(j) Let $A = \{H, T\}$ and $B = \{1, 2, 3\}$. Show that the Cartesian Product of these two sets is not commutative. 2

(k) Examine for which of the following equations, y is a function of x : 2

(i) $x = 5, \forall y$; (ii) $y = 10, \forall x$.

(l) Find $\lim\limits_{x \to 0} \dfrac{3^x - 1}{x}$. 2

(m) Examine whether the following function is continuous at $x = 4$: 2

$$f(x) = \begin{cases} 1 - x, & x \le 4 \\ 2x - 11, & x > 4 \end{cases}$$

(n) Find the marginal and average functions for the following total function : 2

Total function : $R = 10q - q^2$

(o) What is the rank of the matrix $A = \begin{pmatrix} 1 & 5 & 1 \\ 0 & 3 & 9 \\ -1 & 0 & 0 \end{pmatrix}$? 2

Group - B

Answer *any three* questions.

2. Marginal cost is given by $MC = 25 + 30Q - 9Q^2$. Fixed cost is 55.

Find the (a) total cost, (b) average cost, and (c) variable cost functions. 2+2+1

3. In a class of 120 students numbered 1 to 120, all even numbered students opt for Mathematics, those whose numbers are divisible by 5 opt for Statistics and those whose numbers are divisible by 7 opt for Economics. How many students opt for none of the three subjects? 5

4. It is given that for $A = \begin{bmatrix} 1 & 0 & c \\ 0 & a & -b \\ -1/a & x & x^2 \end{bmatrix}$ a, b and c are constants and $a \neq 0$.

Find the values of x for which A^{-1} (inverse of A) exists. 5

5. (a) In game theory, what is —

   (i) a two-person zero-sum game,

   (ii) saddle point?

   (b) Hence find the saddle point of the following two person zero-sum game :

   $$A = \begin{bmatrix} 4 & 1 & -3 \\ 3 & 2 & 5 \\ 0 & 1 & 6 \end{bmatrix}$$ (2+2)+1

6. Considering a matrix $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ explain how, in general, you can find the Eigen values. 5

Group - C

Answer *any three* questions.

7. Consider the following Leontief System where the input matrix and final demand vector are given by :

$$A = \begin{bmatrix} 0.05 & 0.25 & 0.34 \\ 0.33 & 0.1 & 0.12 \\ 0.19 & 0.38 & 0 \end{bmatrix}, \ d = \begin{bmatrix} 1800 \\ 200 \\ 900 \end{bmatrix}$$

   (a) Check whether the system satisfies the Hawkins-Simon Conditions.

   (b) Find the value of the three outputs. 5+5

8. (a) Find the point elasticity of demand, given the demand curve

$$Q = \frac{k}{p^n}; \ k > 0, \ n > 0.$$

   If $n = 1$, what is the value of point elasticity of demand and what is the shape of the demand curve?

   (b) Prove that if a function is differentiable at some point, then it must be continuous at that point; but the converse is not true. (2+1½+1½)+5

Please Turn Over

9. For the following function,

$$y = f(x) = x^3 - 18x^2 + 96x - 80$$

(a) find the critical values,

(b) test for concavity to determine relative maxima or minima,

(c) check for inflection points, and

(d) evaluate the function at the critical values and inflection points. 3+2+2+3

10. (a) Determine the values of the constants a, b, c such that the function

$$f(x, y) = ax^2y + bxy + 2xy^2 + c$$

has a local minimum at the point $\left(\frac{2}{3}, \frac{1}{3}\right)$ with local minimum value $\left(-\frac{1}{9}\right)$.

(b) Comment for quasiconcavity or quasiconvexity of the following function : 5+5

$$y = ax^2 + b, \ (a < o, \ b > o).$$

11. (a) Is the following function differentiable at $x = 2$?

$$y = f(x) = |x - 2| + 1$$

(b) Using Dominance strategy, find the saddle point of the following game : 5+5

Strategies ↘		Player II				
		E	F	G	H	I
Player I	A	2	4	3	8	5
	B	4	5	2	6	7
	C	7	6	8	7	6
	D	5	1	7	4	2