2014

(5th Semester)

ECONOMICS

SEVENTH PAPER

(Quantitative Technique—I)

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(Marks : 50)

The figures in the margin indicate full marks for the questions

1. *(a)* Distinguish between finite and finite set with examples. 2½

(b) Enumerate all the proper subsets of a given set $A=\{0, 3, 5\}$. 2½

(c) State and verify the distributive law of set intersection by using the following : 5

$A=\{2,5\}$, $B=\{3, 4, 5\}$ and $C=\{6, 7\}$

Or

(a) If the supply and demand functions for a commodity are $Q_s = 10p - 6$ and $Q_d = 4p + 12$ respectively, find the equilibrium price. 4

(b) What are the various uses and applications of non-linear equations in economics? Briefly explain them. 6

2. (a) Differentiate the following : 3+3=6

(i) $y = 2x^2 + e^x + \log x$

(ii) $y = \frac{x+1}{x-1}$

(b) Given the demand function for a commodity $q = -5p + 100$; find the point elasticity of demand when $p = 5$. 4

Or

A firm's short-run total cost function is $TC = q^2 - 3q + 500$. The firm is a monopolist and the inverse demand function for its product is $p = -q + 105$. Find the most profitable level of output, and the profits at that output. 7+3=10

3. (a) Evaluate the following functions : 3+3=6

(i) $\int (x^2 + e^x + 2)\,dx$

(ii) $\int \left(\frac{x}{2x^2 + 5}\right) dx$

(b) Find the consumer's surplus when the inverse demand function for a commodity is $p = 100 - 2q$ and the price (p_0) is 20. 4

Or

(a) It is given that the marginal revenue (MR) function for a firm is $MR = 100 - 2q$, find—

(i) the total revenue function; 2

(ii) the demand function; 2

(b) If the demand and supply functions for a commodity are given as

demand function $p_d = 20 - 5q$

supply function $p_s = 4q + 8$

find the producer's surplus at equilibrium. 6

4. (a) State and prove the basic properties of determinant. 6

(b) Verify whether $AB \neq BA$, using the following matrices : 4

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix} \text{ and } B = \begin{bmatrix} 0 & 3 \\ 5 & 2 \end{bmatrix}$$

Or

Solve the following simultaneous equations by matrix inversion method : 10

$$4x+y-5z=8$$
$$-2x+3y+z=12$$
$$3x-y+4z=5$$

5. Solve the following linear programming problem by graphical method. Also indicate the feasible region in diagram. 8+2=10

$$\text{Max } Z = 8x+6y$$
$$\text{subject to } 6x+3y \leq 126$$
$$2x+4y \leq 96$$
$$x, y \geq 0$$

Or

Explain the various procedures involved in formulation of liner programming problem. 10

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ECONOMICS

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(Quantitative Technique—I)

(PART : A—OBJECTIVE)

(*Marks* : 25)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 10)

Tick (✓) the correct answer in the brackets provided : 1×10=10

1. Total revenue (TR) is maximum only when

(a) MR = MC ( )

(b) MR>MC ( )

(c) MR = AR ( )

(d) MR = 0 ( )

2. The value for a function $y = f(x)$, is maximum if

(a) $f'(x) = 0$ and $f''(x) < 0$ ( )

(b) $f'(x) = 0$ and $f''(x) > 0$ ( )

(c) $f'(x) > 0$ and $f''(x) > 0$ ( )

(d) $f'(x) < 0$ and $f''(x) < 0$ ( )

3. Column matrices are those that have

(a) one column and any number of rows ( )

(b) equal number of rows and columns ( )

(c) one row and any number of columns ( )

(d) None of the above ( )

4. For any square matrix to be inversible, the matrix must be a/an

(a) symmetric matrix ( )

(b) idempotent matrix ( )

(c) singular matrix ( )

(d) non-singular matrix ( )

5. Any set containing n number of elements has —— number of subsets.

(a) $2n^2$ ( )

(b) 2^n ( )

(c) n^2 ( )

(d) None of the above ( )

6. Which of the following functions is a quadratic function?

(a) $f(x) = x^3 + 2x + 2$ ( )

(b) $f(x) = x^2 + 4x + 3$ ( )

(c) $f(x) = 2x + 4$ ( )

(d) $f(x) = e^x$ ( )

7. Integration of any given marginal revenue function will yield

(a) total revenue function ( )

(b) average revenue function ( )

(c) maximum revenue function ( )

(d) None of the above ( )

8. In simple term, consumers' surplus refers to

(a) total satisfaction derived from consumption ( )

(b) average satisfaction derived from consumption ( )

(c) marginal satisfaction derived from consumption ( )

(d) net satisfaction derived from consumption ( )

9. Which of the following statements is not true regarding linear programming problem?

(a) Variables are linearly related ( )

(b) Variables can take non-negative values only ( )

(c) There are equality constraint only ( )

(d) None of the above ( )

10. Multiple optimal solutions arise in linear programming problem in case where the

(a) constraint functions have different slopes ( )

(b) objective and constraint function have equal slope ( )

(c) objective and constraint function have unequal slope ( )

(d) two or more constraint lines are intersecting each other ( )

SECTION—B

(*Marks* : 15)

Answer **all** questions : 3×5=15

1. Mention the true relationship between marginal cost (MC) and average cost (AC).

2. Distinguish between singular matrix and non-singular matrix.

3. Define exponential and logarithmic functions.

5. Formulate dual of the given linear programming problem :

$$\text{Max} \quad R = 3x + 2y$$

$$\text{subject to} \quad 2x + y \geq 4$$
$$2x + 3y \geq 12$$
$$x, y \geq 0$$

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