

**4/H-16 (iv) Syllabus-2017**

**2 0 2 5**

( May-June )

**ECONOMICS**

( Honours )

**( Mathematics for Economist )**

*Marks : 75*

*Time : 3 hours*

*The figures in the margin indicate full marks  
for the questions*

Answer **one** question from each Unit

**UNIT—I**

1. (a) Write short notes on any *two* of the following : 4×2=8
- (i) Methods of describing a set
  - (ii) Laws of set operations
  - (iii) De Morgan's law
- (b) Distinguish between function and relation. What are the different types of relations? 4+3=7

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2. (a) Find the equation of the line perpendicular to the line  $x - 7y + 5 = 0$ , and having x-intercept 3. 5
- (b) Distinguish between homogenous and homothetic function. 5
- (c) The demand function for a particular commodity is  $Q_d = 72 - 2p$  and the supply function is given by  $Q_s = -28 + 3p$ . Find the equilibrium price and the equilibrium quantity that will prevail in the market. 5

## UNIT—II

3. (a) Solve the following system of equations by matrix method : 12

$$2x + 2y + 3z = 13$$

$$x - 2y + 3z = 2$$

$$y - z = 1$$

(b) If

$$B = \begin{bmatrix} 3 & -7 & -6 \\ 4 & 8 & -1 \end{bmatrix}$$

and

$$C = \begin{bmatrix} -18 & 17 & 12 \\ 8 & 0 & 14 \end{bmatrix}$$

Find A, if  $A + B = C$ .

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D25/1474

( Continued )

( 3 )

4. (a) Solve the given system of equations using Cramer's rule : 6

$$3x - y + 2z = 4$$

$$x + 3y - 3z = -1$$

$$7x + 5y - z = 9$$

- (b) If A is a singular matrix, find k. 4

$$A = \begin{bmatrix} 2 & 3 & k \\ 4 & 5 & 6 \\ 5 & 7 & 17 \end{bmatrix}$$

- (c) Write a note on Leontief static open model. 5

## UNIT—III

5. (a) Evaluate any three of the following :  $3 \times 3 = 9$

(i)  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{x}$

(ii)  $\lim_{p \rightarrow 2} \frac{p^3 - 8}{p - 2}$

(iii)  $\lim_{h \rightarrow 0} \frac{(x+h)^2 - x^2}{h}$

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( Turn Over )

$$(iv) \lim_{x \rightarrow \infty} \frac{x^2 + 2x - 1}{x^2 + 2}$$

$$(v) \lim_{x \rightarrow 0} \left( x - \frac{3}{x} \right)$$

- (b) Find whether the following function is continuous at  $x = 2$  : 4

$$f(x) = \frac{x^2 + x - 6}{x - 2}$$

- (c) By the definition of first principle, find  $f'(x)$ , if  $f(x) = 5x - 8$ . 2

6. (a) Find  $\frac{dy}{dx}$  on any three of the following :  $3 \times 3 = 9$

$$(i) y = \log \left( \frac{x^2 + 2}{x^2 - 1} \right)$$

$$(ii) y = 2x^2(5x + 3)$$

$$(iii) x^2 + y^2 = 5$$

$$(iv) y = 5^{x^2 + 2x - 3}$$

$$(v) y = (5 - x)^6(2x + 1)^3$$

- (b) If  $u = x^2 + y^2 + z^2$ , prove that

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z} = 2u$$

6

## UNIT—IV

7. (a) What are the first- and second-order conditions for maxima and minima? 4
- (b) For what value of  $x$ , the expression  $2x^3 - 9x^2 + 12x + 6$  is a maximum or a minimum? Find the maximum and the minimum value. 6
- (c) The demand function is given by

$$q = \frac{20}{p + 2}$$

Find price elasticity of demand when price  $p = 3$ . Also interpret the result.

4 + 1 = 5

8. (a) The demand equation for a manufacturer is given by  $p = 500 - 2x$  and his average cost function is

$$(0.25)x + 4 + \frac{400}{x}$$

where  $x$  = output and  $p$  = price. Determine—

- (i) the level of output at which the profit is maximised;
- (ii) the price at which this occurs;
- (iii) the maximum profit.  $3 + 3 + 2 = 8$

- (b) Given the total cost function

$$C = 500 + 25x + 2.5x^2$$

where  $x$  = output. Find the output at which average cost is minimum and prove that at this output, average cost equals to marginal cost.

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#### UNIT—V

9. (a) Evaluate any *three* of the following.:

3×3=9

(i)  $\int (x^3 - x + 1) dx$

(ii)  $\int \left( \frac{2x - 3x^3}{x} \right) dx$

(iii)  $\int x e^{-3x^2} dx$

(iv)  $\int x^3 \log x dx$

(v)  $\int \frac{1}{3x-5} dx$

- (b) The supply function of a manufacturer is  $p = 100 + 15q$ . Find the producer's surplus when equilibrium price is 10.

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10. (a) If  $Q_d = 250 - 50p$  and  $Q_s = 25p + 25$  are the demand and supply functions respectively, calculate consumer's surplus.

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- (b) What are the fundamental properties of definite integrals?

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- (c) Evaluate

$$\int_2^3 (8x^3 + 3a^2 + 6x) dx$$

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