

2019

B.Sc.

1st Semester Examination

**ECONOMICS (Honours)**

**Paper - C 2-T**

**(Mathematical Methods in Economics-1)**

Full Marks : 60

Time : 3 Hours

*The figures in the margin indicate full marks.  
Candidates are required to give their answers  
in their own words as far as practicable.  
Illustrate the answers wherever necessary.*

**Group - A**

Answer any *ten* questions.

10×2

1. (a) Distinguish between ordered pairs and unordered pairs.
- (b) Define identical set.

[ Turn Over ]

(c) Given  $S_1 = \{3, 6, 9\}$ ,  $S_2 = \{a, b\}$  and

$S_3 = \{m, n\}$ . Find the cartesian product  $S_1 \times S_2 \times S_3$ .

(d) What do you mean by a polynomial function? Give an economic example.

(e) Define range and domain.

(f) Distinguish between a local maximum and global maximum of a function.

(g) Show that the function must be a relation but a relation may not be a function.

(h) Find the derivative of  $\frac{4x}{3x+8}$

(i) What do you mean by Probability mass function?

(j) Find the partial derivatives with respect to  $x_1$  and  $x_2$  of the following function :

$$y = 2x_1^3 - 11x_1^2x_2^2 + 3x_2^2$$

(k) For what values of  $C$  will the quadratic  $2x^2 + 3x + C = 0$  have real roots?

(l) If  $f(x) = b \frac{x-a}{b-a} + a \frac{x-b}{a-b}$ ,

show that  $f(a) + f(b) = f(a+b)$ .

(m) Evaluate :  $\lim_{x \rightarrow 0} \frac{\sqrt{1+2x} - \sqrt{1-3x}}{x}$

(n) Show whether the function

$$f(x) = \frac{x^2 - 9}{x + 3} \text{ at } x = -3 \text{ is continuous,}$$

(o) If a dice is thrown, find the chance that any one of 1, 2, 3 turns up.

### Group - B

Answer any *four* questions.

4×5

2. (a) Marginal propensity to consume  $\left(\frac{dc}{dy}\right)$  of a

society is 0.75 and its autonomous consumption is Rs. 1200 (i. e.,  $c = \text{Rs. } 1200$  for  $y = 0$ ). Find the consumption function.

[ Turn Over ]

(b) With usual notation, prove that

$$P(A+B) = P(A) + P(B) - (A \cap B)$$

(c) Show that  $f(x)$  denoted by

$$f(x) = x, \quad 0 < x < 1$$

$$= k - x, \quad 1 < x \leq 2$$

$$= 0, \quad x > 2$$

will be a density function of random variable.  
Find  $k$ .

(d) If the demand function is given by  $P=460-3q$ , find the consumer's surplus when 92 units of the commodity are sold.

(e) Assume that  $p = a - bq$ , as the price equation and the cost equation is given by  $C = k + cq + dq^2$ . Find the expression for profit maximising  $p$  and  $q$ . What restrictions will you put on the value of the coefficient  $d$  ?

(f) A bag contains 4 white, 5 red and 6 green balls. Three balls are drawn at random. What is the chance that a white, a red and a green ball is drawn?

## Group - C

Answer any *two* questions.

2×10

3. (a) (i) Given the demand and supply functions for the Cobweb model as follows,

$$Q_{dt} = 18 - 3P_t \text{ and}$$

$$Q_{st} = 3 + 4P_{t-1}$$

Find the intertemporal equilibrium price, and examine whether the equilibrium is stable or not.

- (ii) Find

$$\lim_{x \rightarrow 4} \frac{y}{x-4} = \frac{x^2 - 9x + 20}{x-4} \quad 6+4$$

3. (b) (i) We have  $Y=150+7x$ , where the highest value of  $x=100$ . Find the domain and range of the function and express it as a set.

- (ii) Given,

$$F(X, Y) = 7X^2 + 2XY^2 + 9Y^4 = 0$$

[ Turn Over ]

Use, the Implicit function rule to find

$$\frac{dy}{dx} \quad 5+5$$

3. (c) (i) Calculate  $\int x \log x \, dx$  5

(ii) If MC of the firm is  $C'(Q) = 3e^{-3Q}$

Fixed cost  $C_F = 90$

Find total cost function. 5

(d) An urn contains 8 white and 3 red balls. If two balls are drawn at random, find the probability that

(i) both are white,

(ii) both are red,

(iii) one is of each colour.

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