2018

CBCS

1st Semester

ECONOMICS

PAPER—C2T

(Honours)

Full Marks : 60

Time : 3 Hours

The figures in the right-hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

Mathematical Methods in Economics—I

Group—A

1. Answer any *ten* questions. 10×2

   (a) Find the value of x such that
   $$|3 - 8x| \leq 5 .$$

   (b) Find the derivative of $\dfrac{6x}{x + 5}$.

   (c) Find the total differential for the following function :
   $$Z = 3x^2 + xy - 2y^3$$

(d) Examine if the function $y = 7x + 21$ is monotonic. Find $\dfrac{dx}{dy}$ by applying the Inverse function rule.

(e) If a dice is thrown, find the probability that a 3 will turn up?

(f) Find the equilibrium solution of the following model:

$$Q_d = Q_s$$
$$Q_d = 3 - P^2$$
$$Q_s = 6P - 4$$

(g) What is a convex function?

(h) Define polynomial function.

(i) Integrate $\int (5x + 7)^8 dx$.

(j) What is meant by Conditional Probability?

(k) Solve the difference equation:

$$y_{t+1} - y_t = -0.2\, y_t\ .$$

(l) Give the classical definition of probability.

(m) Distinguish between a discrete random variable and a continuous random variable.

(n) What are the mutually exclusive events?

(o) Give the example of a sure event and an impossible event.

2. Use Jacobian determinants to test the existence of functional dependence between the paired functions :

$$Y_1 = x_1 + 2x_2$$
$$Y_2 = x_1^2 + 4x_1x_2 + 4x_2^2.$$

3. If the demand function is $x = \dfrac{20}{P+1}$. Find price elasticity of demand with respect to price at the point where $P = 3$.

4. Show whether the following function is concave, convex, strictly concave, strictly convex or neither,

$$Z = (x_1 + x_2)^2.$$

5. Let the marginal cost function of a firm be $100 - 10x + 0.1x^2$, where x is the output. Obtain the total cost function of the firm under the assumption that its fixed cost is Rs. 500.

6. Find the limit

$$\lim_{x \to 2} \frac{x^2 - 2x}{x^3 - 8}.$$

7. An unbiased coin is tossed 2 times. If the random variable *X denotes* the number of heads obtained, find the distribution function of the random variable X.

8. (a) State and prove the theorem of total probability for two events A and B, when they are not mutually exclusive.

   (b) Two students X and Y work independently on a problem. The probability that X will solve it is 3/4 and the probability that Y will solve it is 2/3. What is the probability that the problem will be solved?   6+4

9. Solve the following Cobweb model where,
   Demand function $Q_{dt} = c - dP_t$, $c, d > 0$
   Supply function $Q_{st} = a + bP_{t-1}$, $a, b > 0$
   What are the conditions for explosive, uniform and damped oscillations?   7+3

10. State and explain the profit maximization condition of a firm. A firm has the following total cost and demand functions :

$$C = \frac{1}{3}Q^3 - 7Q^2 + 111Q + 50$$

$$P = 100 - Q.$$

Find profit maximising level of output. Also find profit at this level of output.   5+5

11. A bag contains 6 white and 9 black balls. Four balls are drawn at a time. Find the probability for the first drawn give 4 white and the second to give 4 black balls in each of the following cases :

   (a) The balls are not replaced before the second draw.

   (b) The balls are replaced before the second draw.

                                                5+5

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