Downloaded from https://elearningbengali.in

2018/TDC/ODD/ECOC–102T/043

TDC (CBCS) Odd Semester Exam., 2018

ECONOMICS

(1st Semester)

Course No. : ECOHCC–102T

(Mathematical Methods in Economics—I)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **all** questions

UNIT—I

1. Answer any *two* of the following : 2+2=4

(a) Find the truth values of ~ P when P is T and P is F.

(b) Find the following :

(i) $A \cup A'$

(ii) $A \cap \phi$

(c) Write the two roots of the quadratic function $ax^2 + bx + c = 0$.

Downloaded from https://elearningbengali.in

2. Answer either *(a)* or *(b)* :

(a) *(i)* Prove that the following function is continuous at $x = 3$: 5

$$f(x) = \frac{x^2 - x - 6}{x - 3}, \quad x \neq 3$$
$$= 5 \quad , \quad x = 3$$

(ii) In a class of 96 students, 50 play cricket and 32 play cricket but not football. Determine through set algebra the number of students who play both cricket and football; and the number of students who play football, but not cricket. 5

(b) *(i)* Construct the truth table for the statements $p \vee \sim (p \wedge q)$ and $(p \wedge q) \wedge \sim (p \vee q)$. 5

(ii) Convert the following into their fractional form : 5

1·6666... 1·222...

UNIT—II

3. Answer any *two* of the following : 2+2=4

(a) Give one example each of an explicit function and an implicit function.

(Continued)

(b) Draw a free-hand graph of the function $y = \frac{1}{x}$.

(c) What is the *n*th term of the following series?

2 6 18 ...

4. Answer either *(a)* or *(b)* :

(a) *(i)* Calculate the sum of the first *n* natural numbers. 5

(ii) If *a*, *b* and *c* are three consecutive integers, prove that

$$\log(1 + ac) = 2 \log b$$ 5

(b) *(i)* Find the sum of the following series : 5

$$1^2 + 2^2 + ... + 9^2$$

(ii) Discuss the convergence of

$$\frac{1}{1 \cdot 2 \cdot 3} + \frac{3}{2 \cdot 3 \cdot 4} + \frac{5}{3 \cdot 4 \cdot 5} + \cdots \infty$$ 5

UNIT—III

5. Answer any *two* of the following : 2+2=4

(a) If $y = f(x)$, define $\frac{dy}{dx}$.

(Turn Over)

Downloaded from https://elearningbengali.in

(b) Write the differential quotient of e^{mx} and x^n.

(c) Find $\frac{d}{dx}\left(x^5 + x^3 + \frac{1}{x}\right)$.

6. Answer either *(a)* or *(b)* :

(a) (i) If $x = at^2$ and $y = 2at$, find $\frac{dy}{dx}$. 3

(ii) Write out the conditions of maximum and minimum for the function $y = f(x)$. 3

(iii) Find $\frac{dy}{dx}$ of the function

$$z = 2x^2 + 5x^2y + xy^2 + y^2$$ 4

(b) (i) Find for what value of x, the following expression is maximum or minimum :

$$y = 2x^3 - 21x^2 + 36x - 20$$

Find also the maximum and minimum values. 5

(ii) Given that $z = x^3e^{2y}$, find all the second-order partial derivatives. 5

(Continued)

UNIT—IV

7. Answer any *two* of the following : 2+2=4

(a) Show graphically local and global maxima.

(b) If $y = f(x)$ is a function, write out the condition for its convexity.

(c) Determine whether $y = 1 + 2x - x^2$ rises, falls or remains stationary at $x = 1$.

8. Answer either *(a)* or *(b)* :

(a) (i) A firm produces an output of x tonnes of a certain product at a total cost of $c = x^3 - 4x^2 + 7x$. Find at what level of output average cost is minimum and what level is it? 5

(ii) The demand function of a particular commodity is $y = 15e^{-x/3}$ for $0 < x \leq 8$, where y is the price per unit and x is the number of units demanded. Determine the price, and the quantity for which revenue is the maximum. 5

(Turn Over)

Downloaded from https://elearningbengali.in

(b) (i) The cost function for producing x units of a product is $C(X) = x^2 - 12x^2 + 48x + 11$ and the revenue function is $R = 83x - 4x^2 - 21$. Find the output for which profit is maximum. Also find the maximum profit. 5

(ii) Following are the demand functions for two commodities x_1 and x_2. Determine whether the commodities are complementary or competitive :

$x_1 = p_1^{-1.7} p_2^{0.8}$ and $x_2 = p_1^{0.5} p_2^{-0.2}$ 5

UNIT—V

9. Answer any *two* of the following : 2+2=4

(a) Write the value of $\int x^n dx$ and $\int \frac{1}{x} dx$.

(b) Determine the integral of $x^3 + 5x^2 - 6x + 8$.

(c) Determine $\int e^{mx} dx$.

(Continued)

10. Answer either (a) or (b) :

(a) Find integral of the following functions : 10

(i) $\int \frac{3x+4}{6x+7} dx$

(ii) $\int \frac{dx}{\sqrt{x+1} - \sqrt{x}}$

(iii) $\int x \log x \, dx$

(iv) $\int \frac{3x+4}{x^2 + x - 6} dx$

(b) (i) Evaluate—

(1) $\int_2^4 4x \, dx$

(2) $\int_0^1 \frac{e^x}{1+e^x} dx$ 2+3=5

(ii) If the demand function is $P = 35 - 2x - x^2$ and the demand x_0 is 3, then find the consumer's surplus. 5

★ ★ ★