



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 $\sim P$ 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 $ax^2 + bx + c = 0$.



(2)

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

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

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

$$= 5, \quad x = 3$$

(ii) In a class of 96 students, 50 play cricket and 32 play football but not cricket. 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.

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

(ii) Convert the following into their fractional form :

$$1.6666\dots \quad 1.222\dots$$

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.

(3)

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

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

$$2 \quad 6 \quad 18 \dots$$

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

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

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

$$1^2 + 2^2 + \dots + 9^2$$

(ii) Discuss the convergence of

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

UNIT—III

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

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



(4)

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

J9/1076

(Continued)

(5)

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

J9/1076

(Turn Over)



(6)

(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 :

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

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 $\int e^{mx} dx$.

(7)

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
