

MA ECONOMICS  
First Semester  
MATHEMATICAL ECONOMICS  
(MEC - 04)

Duration: 3Hrs.

Full Marks: 70

Part-A (Objective) =20  
Part-B (Descriptive)=50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins.

Marks: 50

1. Answer the following (any *five*)

2×5=10

- What does derivative mean?
- Define Euler's theorem.
- Find  $\int 1/x^5 dx$ .
- Write the following sets in Roster as well as builder method
  - All positive even integers less than 20.
  - All the months of English Calendar year.
- In an A.P. the  $n$ th term is  $3n-1$  find the series
- Prove that  $\log_2[\log_2(\log_2 16)] = 1$
- Find  $dy/dx$  of  $y = x^5/(x+1)$

2. Answer the following (any *five*)

3×5=15

- Distinguish between variable and parameter.
- Give the economic interpretation of derivative with suitable example.
- Find the slope of Average Cost curve if  
 $AC = 2x + 3x^2 - 5000$

d) Given  $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$  Show that  $A^2 - 4A - 5I = 0$

e) If  $\log(x^2 Y^3) = a$  and  $\log \frac{x}{Y} = b$  find  $\log x$  and  $\log y$ .



- f) Find Marginal Cost (MC) from the following Total Cost function  $TC = x^3 + 2x^2 + 2x + 1$
- g) The total cost function of a firm is given by  $TC = 625 - 5q + q^2$  show that the optimum size of output of the firm is 25 units.

**3. Answer the following (any five)**

**5×5=25**

- a) The total cost C of a firm is given by

$$C = 1000 + 100q - 80q^2 + \frac{1}{3}q^3$$

Where q is the quantity produced.

- i) Find the marginal cost of production
- ii) At what value of q does marginal cost equal average variable cost?
- b) A firm has the total cost (C) function
- $$C = 7q^2 + 5q + 120$$
- And demand function
- $$P = 180 - 0.5q$$
- And also subsidy of Rs. 5/- per unit of output is paid by the government. Find Profit maximising output and price
- c) A monopolist discriminates prices between two markets 1 and 2 and his average revenue functions are given by
- $$AR_1 = 55 - 4Q_1$$
- $$AR_2 = 25 - 3Q_2$$
- The total cost function is given by
- $$C = 20 - 5Q + 2Q^2, \text{ where } Q = Q_1 + Q_2$$

- i) Find the profit maximising output to be sold in the two markets.
- d) If consumer's demand function is given by

$$Q = \sqrt{(60 - 2p)}$$

Find consumer's surplus when market price  $P = 12$

- e) Derive the shape of Indifference curve from the utility function.
- f) In a class there are 100 students who have taken at least one of the subjects Mathematics and Biology. If 75 students have taken Mathematics and 60 students have taken biology, find the number of students who have taken (a) both Mathematics and Biology (b) Mathematics but not Biology (c) Biology but not Mathematics.

g) The sum of three numbers is 6. If we multiply the third number by 2 and add the first number to the result, we get 7. By adding second and third numbers to three times the first number, we get 12. Using matrix method finds the numbers.

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**MA ECONOMICS**  
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**MATHEMATICAL ECONOMICS**  
**(MEC-04)**

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

**Duration: 20 minutes**

**Marks – 20**

**PART A- Objective Type**

**I. Choose the correct options from the following: 1×20=20**

1. Derivative of  $x^n$

- a.  $2x$
- b.  $nx^{n-1}$
- c.  $x^{n-1}$
- d.  $x$

2. If  $Y=C$  where  $C$  is constant, then derivative of  $Y$

- a.  $C$
- b.  $0$
- c.  $2C$
- d.  $C^2$

3. When  $y = \log x$ , then  $\frac{dy}{dx}$

- a.  $X$
- b.  $\log x$
- c.  $\frac{1}{x}$
- d.  $x^2$

4. At the minimum point of AC curve  $\frac{dAC}{dq} = \text{-----}$  if quantity is denoted by  $q$ .

- a.  $2$
- b.  $4$
- c.  $0$
- d.  $AC$

5. If  $y = \frac{1}{x^2}$ , then  $\frac{dy}{dx} =$

- a.  $1/x^2$
- b.  $-1/x^2$
- c.  $x^2$
- d.  $\frac{1}{x}$

6. What is the slope of the AC curve at the downward part of it?
- Positive
  - Negative
  - Zero
  - Unitary
7. A function  $y=f(x)$  will attain relative maximum if
- $\frac{dy}{dx}=0$
  - $d^2y/dx^2 < 0$
  - $d^2y/dx^2 > 0$
  - Both a and b
8. A function  $y=f(x)$  will attain relative minimum if
- $\frac{dy}{dx}=0$
  - $d^2y/dx^2 < 0$
  - $d^2y/dx^2 > 0$
  - Both a and c
9. Cobb Douglas production function is a-----production function
- Homogeneous
  - Linear
  - Non linear
  - Both a and b
10. Price discrimination means
- Charging different prices from different customers
  - Charging equal prices from different customers
  - Selling same commodity to different consumers
  - All the above are true
11. Integration is
- Opposite of Differentiation
  - Same as Differentiation
  - Part of differentiation
  - None of these
12. Consumer surplus means
- Actual - Expected
  - Expected - Actual
  - Expected = Actual
  - None of these
13. Which of the following set is finite?
- All lines parallel to a given line
  - All positive integers
  - All IIT s of India
  - All of these

14. Let  $A = \{ 2, 4, 6, 8, \dots \}$   $B = \{ 1, 2, 3, 4, 5, \dots \}$  and  $C = \{ x: x \text{ is a multiple of } 2 \}$ . Which of the statements is true?
- a.  $A \subset B$                       b.  $A \subset C$                       c.  $C \subset A$                       d. Both a) & b)
15.  $\log_a b \times \log_b a = ?$
- a. 0                                  b. 1                                  c. 2                                  d. None of these
16. Logarithm of 625 to the base  $\sqrt{5}$  is
- a. 2                                  b. 3                                  c. 4                                  d. None of these
17. Find the 10<sup>th</sup> term of the series 1, -2, 4, -8, ----
- a. -612                              b. -512                              c. -412                              d. None of these
18. Inverse of matrix A exist if A is
- a. Singular                      b. non singular                      c. scalar                      d. None of these
19. For matrix A, which one is true?
- a.  $|A| = |A^T|$                       b.  $|A| \neq |A^T|$                       c. Both a) & b)                      d. None of these
20. Identify the following function  $D = AP^\alpha N^\beta$
- a. Engel curve type                      b. CES production function  
c. VES production function                      d. None of the above

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