MASTER OF ECONOMICS
First Semester
MATHEMATICAL ECONOMICS
(MEC- 04)

Duration: 3Hrs.   **Full Marks: 70**

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins.   **Marks: 50**

I. Answer any *five* of the following questions: 10×5=50

1. **a.** Define power set and singleton set.   2+3+5 = 10
   b. Express the following in both Set Builder and Roaster Method
      (i) Prime factors of 80   (ii) Root of the equation $4x^2 -12x + 9$
   c. In a group of 80 men who can write at least one of the languages English and Hindi, if 40 of them can write English but not Hindi, 30 of them can write Hindi but not English, Find how many of them can write
      (i) Both the language   (ii) English   (iii) Hindi.

2. **a.** If the sum of first six terms of an A.P. is five times, the sum of next six terms and if first term be 100, then find the common difference. **2+3+5=10**
   b. Find the term independent of x in the expansion of $(x + 1/x)^{10}$
   c. (i) Prove that $\log_2 [\log_2 (\log_2 16)] = 1$
      (ii) Find the value of x from the following equation
      $$\log 10^{(3x+2)} = \log 10^{(x-1)} = 1$$

3. **a.** Define null matrix and column matrix.   2+3+5= 10
   b. Find the rank of the matrix

   $$\begin{pmatrix} 2 & 0 & 5 \\ 2 & 5 & 3 \\ 0 & -5 & 2 \end{pmatrix}$$

c. Solve the following system of equations using matrix inverse method.

$$x + 2y + z = 7, \ x + 3z = 11, \ 2x - 3y = 1$$

4. a. What do you mean by range and images of a function.   2+3+5=10

b. Find $\lim_{x \to 3} \dfrac{x^2 - 5x + 6}{x^2 - 9x + 18}$

c. When a limit exist?

Find $\lim_{x \to \infty}(\sqrt{x+1} - \sqrt{x})$

5. Find the derivative of the following   5+5= 10

    a. $\log_e(1/x) - 7e^x + 5/3 \ a^x$

    b. $\dfrac{x^2 + 3x + 5}{x^2 + 2}$

6. a. If $U = \{3, 4, 5, 6, 7, 8\}$, $A = \{3, 4, 7\}$ and $B = \{4, 5, 6, 7\}$ 5+5= 10

    Show that $(A \cup B)^c = A^c \cap B^c$ by Venn diagram

b. Integrate $f(x) = (25 + 10x^2)2x^3$

7. a. The average revenue function is given by   5+5=10

    $AR = 450 - 8q + 3q^2$

    Find out the elasticity of demand when $q=5$

b. Find out relative extreme of the function $y = 40x + 3x^2$. Also display the diagrammatic representation.

8. The total cost C of a firm is given by   10

    $C = 200 + 100q - 70 q^2 + \frac{1}{4} q^4$

Where q is the quantity produced

    i. Find the marginal cost production

    ii. At what value of q does marginal cost equal average variable cost?

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Duration: 20 minutes   **Marks – 20**

(PART A- Objective Type)

I. Choose the correct answer: **1×20=20**

1. If A= { 3,4,6,8,9} and B= { 2,5,6, 7,10} , then A ∩ B is a _____ .

   a. Null Set   b. Singleton   c. Power set   d. None of these.

2. A∪ $(B \cap C) = (A \cup B) \cap (A \cup C)$

   a. True   b. False   c. Both   d. Neither true nor false

3. If B is a subset of A then

   a. A =B   b. A< B   c. A ≤ B   d. A ≥ B

4. Difference of set A and B is denoted by_____

   a. A-B   b. A/B   c. both a and b   d. None of these

5. The 17th term of the series -2, 1, 4,7 -----

   a. 45   b. 44   c. 47   d. None of these

6. If three numbers a, b, c are in AP , then

   a. b-a = c-b   b. a+c= 2b   c. Both i.& ii.   d. None of these

7. The sum of the series 1, -3, 9, -27 --------- up to 9 terms is_____

     a. 3921   b. 4921   c. 5921   d. None of these

8. The total numbers of terms in $(2+ 3x)^{15}$ are

     a. 14   b.15   c. 16   d. 17

9. The general term of $(x^2 + 3/x)^6$ is

     a.6 $3^r x^{12-3r}$ b. 6 $3^{12-3r} x^r$ c. Both   d. None of these

10. Geometric mean between 3 and 12

     a. 3   b. 4   c. 5   d. 6

11. $\log_x z \cdot \log_z x$ = ?

     a. 1   b. 2   c. 3   d. None of these

12. A matrix has 15 elements . Mention total possible order.

     a. 4   b. 5   c. 6   d. None of these.

13. If A is a 3x4 matrix and B is a 4x4 matrix does AB exist?

     a. Exist   b. Does not Exist   c. Partially exist   d. None of these

14. A square matrix is invertible if and only if it is _____.

     a. singular   b.non singular   c. transpose of the matrix   d. None of these

15. $(a/b)^n$= ?

    a. a/b^n b. a^n/b c. a^n/b^n d. None of these

16. If f(x)= 6 then $\lim_{x \to 0} f(x) = ?$

    a. 0   b. 1   c. 6   d. None of these

17. The function y= f(x) is continuous at x=a if

    a. f(a) exists and is finite   b. $\lim_{x \to a} f(x) = f(a)$

    c. both a & b   d. None of these

18. Point elasticity of demand (e_d) is defined by the relation

    a. $\dfrac{AR}{AR-MR}$ b. $\dfrac{MR}{MR-AR}$ c. $\dfrac{MR}{AR-MR}$ d. None of these

19. The function Y= f(x) will attain maximum value when

    a. $f''(x) = \dfrac{d^2 y}{dx} = 0$ b. $f''(x) = \dfrac{d^2 y}{dx} < 0$

    c. $f''(x) = \dfrac{d^2 y}{dx} > 0$ d. None of these

20. $\int \frac{1}{x} dx = ?$

    a. x   b. $\frac{1}{x}$ c. $\log x$ d. None of these

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