

**2024/FYUG/ODD/SEM/  
MATIDC-101T/282**

**FYUG Odd Semester Exam., 2024**

**MATHEMATICS  
( 1st Semester )**

Course No. : MATIDC-101T

**( Foundation Course in Mathematics )**

Full Marks : 70

Pass Marks : 28

Time : 3 hours

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

**UNIT—I**

1. Answer any *four* from the following : 1×4=4
- (a) Define rational number. Give example.
- (b) Express  $\frac{4}{5}$  in percentage.
- (c) Find the GCD of 18 and 15.
- (d) Find the ratio of 5 m to 10 km.
- (e) A sum of ₹ 10,000 is borrowed at a rate of interest 15% per annum for 2 years. Find the simple interest.

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2. The selling price of an object is ₹ 1,800. If a profit of ₹ 300 is gained after selling it, what is the percentage of profit? 2

OR

3. Express the following in the form  $\frac{p}{q}$ , where  $p$  and  $q$  are integers and  $q \neq 0$ ,  $0.4\bar{7}$ . 2

4. (a) A sum of ₹ 20,000 is borrowed by Heena for 2 years at an interest of 8% compounded annually. Find the compound interest (CI) and the amount she has to pay at the end of 2 years.

3+1=4

- (b) A number when reduced by 5% becomes 133. What is the number? 4

OR

5. (a) Find the greatest number of 4 digits which is exactly divisible by 40, 48 and 60. 4

- (b) A and B together have ₹ 1,210. If  $\frac{4}{15}$  of A's amount is equal to  $\frac{2}{5}$  of B's amount, how much amount does B have? 4

### UNIT—II

6. Answer any four from the following as directed : 1×4=4

- (a) If  $A = \{1, 2, 3\}$ , then find the subsets of the set A.

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- (b) Every set is a subset of itself.  
(Write True or False)

- (c) Find the value of  $(-3)^4 \times \left(\frac{5}{3}\right)^4$ .

- (d) A truck travels 60 km in first hour and 80 km in second hour. What is average speed of the truck?

- (e) 20 chocolates cost ₹ 320. Find the cost of 35 such chocolates.

7. Find the value of  $m$  for which

$$5^m \div 5^{-3} = 5^8 \quad 2$$

OR

8. If  $A = \{1, 2, 3, 4, 5, 6\}$ ,  $B = \{0, 2, 4, 6, 8\}$ , find  $A \cap B$  and  $A - B$ . 2

9. (a) If A and B are any two sets, then prove that  $(A \cup B)' = A' \cap B'$ . 4

- (b) If  $A = \{1, 2, 3\}$ ,  $B = \{3, 4\}$ ,  $C = \{1, 3, 5\}$ , then find (i)  $A \times (B \cup C)$  and (ii)  $A \times (B \cap C)$ . 4

OR

10. (a) Anil can do a piece of work in 5 days and Ankur in 4 days. How long they take to do the same work if they work together? 4

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(b) Simplify :

$2+2=4$

(i)  $\left(\frac{1}{2}\right)^{-2} + \left(\frac{1}{3}\right)^{-2} + \left(\frac{1}{4}\right)^{-2}$

(ii)  $(\sqrt{20} - \sqrt{5})^2$

**UNIT—III**11. Answer any four from the following :  $1 \times 4 = 4$ (a) Write the conditions for the quadratic equation  $ax^2 + bx + c = 0$  having equal roots.(b) Solve  $x^2 + 2x + 1 = 0$ .(c) If  $\frac{2}{3}$ ,  $k$ ,  $\frac{5}{8}$  are in AP, then find the value of  $k$ .(d) Find the solution of  $x + 2y = 6$ ,  $x - y = 3$ .

(e) What is the degree of a linear equation?

12. 12 chairs and 9 tables cost ₹ 4,950 and 5 chairs and 6 tables cost ₹ 2,850. Find the cost of one chair and one table.  $2$ **OR**13. If 2 and 3 are two roots of a quadratic equation, then find that quadratic equation.  $2$ 14. (a) Solve the following for  $x$  and  $y$  :

$$\frac{2}{y} + \frac{5}{x} = 19, \frac{5}{y} - \frac{3}{x} = 1 \quad 4$$

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(b) Show that the sequence 9, 12, 15, 18, ... is in AP. Find its 16th term and the general term.  $1+2+1=4$ **OR**15. (a) Solve :  $4$ 

$$\sqrt{x+5} + \sqrt{x+21} = \sqrt{6x+40}$$

(b) If the sum of three numbers in GP is 38 and their product is 1728, then find them.  $4$ **UNIT—IV**16. Answer any four from the following :  $1 \times 4 = 4$ (a) Compute  $\frac{20!}{18!}$ .

(b) There are 3 candidates for a classical, 5 for a mathematical and 4 for a natural science scholarship. In how many ways can these scholarships be awarded?

(c) If  ${}^n C_{15} = {}^n C_8$ , then find the value of  $n$ .

(d) Mention the probability of an impossible event.

(e) Find the number of terms in the expansion of  $(2x - 3y)^9$ .17. Expand  $(x + 2y)^5$  using binomial theorem.  $2$ **OR**18. Find  $n$ , if  $(n + 2)! = 2550 \times n!$   $2$ 

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19. (a) A committee of 3 persons is to be constituted from a group of 2 men and 3 women. In how many ways can this be done? How many of these committees would consist of 1 man and 2 women?

$$2+2=4$$

- (b) Find the number of permutations of the letters of the word 'COLLEGE' taken all together.

4

OR

20. (a) Calculate the coefficient of  $x^6$  in the expansion of

$$\left(x + \frac{1}{x^2}\right)^{13}$$

4

- (b) Find the probability of getting at most 2 heads in tossing a coin 3 times.

4

## UNIT—V

21. Answer any four from the following as directed :

1×4=4

- (a) If

$$A = \begin{bmatrix} 2 & 7 \\ 9 & 8 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$$

then find  $A - B$ .

- (b) Define a square matrix. Give example.

(c) Evaluate  $\begin{vmatrix} \sin x & \cos x \\ -\cos x & \sin x \end{vmatrix}$ .

- (d) A square matrix  $A = [a_{ij}]$  is called a symmetric matrix, if  $a_{ij} = -a_{ji}$  for all  $i, j$ .

(Write True or False)

- (e) If  $A = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$ , then find  $A^2$ .

22. If

$$A = \begin{bmatrix} 1 & -2 & 3 \\ 3 & 2 & -1 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & 3 \\ -1 & -2 \\ 4 & -5 \end{bmatrix}$$

then find  $AB$  and  $BA$ .

2

OR

23. Find the adjoint of matrix

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & -3 \\ -1 & 2 & 3 \end{bmatrix}$$

2

24. (a) Find the inverse of the matrix

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{bmatrix}$$

4

- (b) Using matrices and determinants, solve the linear equations

$$x - 2y = 4, -3x + 5y = -7$$

4

OR

25. (a) Show that

$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = xyz(x-y)(y-z)(z-x) \quad 4$$

(b) If

$$A = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix} \text{ and } B = [-2 \quad -1 \quad -4]$$

verify that  $(AB)^T = B^T A^T$ . 4

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