2023/FYUG/ODD/SEM/
MATIDC–101T/144

FYUG Odd Semester Exam., 2023
(Held in 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

SECTION—A

Answer *twenty* questions, selecting *four* from each Unit : 1×20=20

UNIT—I

1. Write the place value of the digit 2 in the number 73·42.

2. Every natural number is an integer. Write True or False.

3. Find the greatest common divisor (GCD) of 24 and 18.

4. Write two equivalent fractions of $\frac{3}{7}$.

5. Find the value of x if $\frac{15}{18} = \frac{x}{30}$.

UNIT—II

6. If

$$3^x = \frac{1}{81}$$

then find the value of x.

7. If A and B are two sets, then $A \subseteq A \cup B$. Write True or False.

8. List all the elements of the set $A = \{x : x \text{ is an integer, } x^2 \leq 4\}$.

9. A person crosses 600 m long street in 5 minutes. What is the average speed in meter per second.

10. 120 men consume 720 kg of rice in 30 days. What is the consuming capacity for a man?

UNIT—III

11. Find the value of k, if $x = 2$, $y = 1$ is a solution of the equation $2x + 3y = k$.

12. Find two different solutions of the equation $x + 2y = 6$.

13. The sequence 28, x, 20 is in an AP. Find the value of x.

14. Write the sum of a GP series whose first term is a common ratio is r and number of terms is n.

15. Write the conditions for the quadratic equation $ax^2 + bx + c = 0$ having equal roots.

UNIT—IV

16. How many three-digit integers are there in the set of natural numbers that are odd?

17. How many factors are there for the number $2^5 4^3$?

18. The probability of happening of an event E is a number $P(E)$ such that $-1 \leq P(E) \leq 1$. Write True or False.

19. Find

$$P(A^c)$$

if $P(A) = \frac{3}{4}$.

20. Find the general term, $(r+1)$th term of the expansion of $(a+b)^n$.

UNIT—V

21. Give an example of a matrix whose order is 1×5.

22. If the number of columns in A equals the number of rows in B, then the two matrices A and B can be multiplied. Write True or False.

23. Give an example of symmetric matrix.

24. Find Det A if

$$A = \begin{bmatrix} 15 & 20 & 30 \\ 3 & 4 & 6 \\ 11 & 25 & 19 \end{bmatrix}$$

25. For what values of x, the matrix $\begin{bmatrix} x & 5 \\ 0 & 9 \end{bmatrix}$ is a singular matrix.

SECTION—B

Answer *five* questions, selecting *one* from each Unit : $2 \times 5 = 10$

UNIT—I

26. Calculate the simple interest on ₹ 8000 for 15 months at 6 paise per rupee per month.

27. The product of two numbers is 120. If their HCF is 6, then find the LCM of the numbers.

UNIT—II

28. Smith, James and William can do a piece of work in 6, 12 and 24 days respectively. In what time will they finish the work while working together?

29. Write all the subsets of the set $A = \{1, 2, 3\}$.

UNIT—III

30. If the first, second and last terms of a arithmetic progression are 5, 9 and 101 respectively, find the total number of terms in that arithmetic progression.

31. The product of two consecutive numbers is 420, and their sum is 41. Find the numbers.

UNIT—IV

32. Find the coefficient of x^3 in the expansion $(1+x)^7$.

33. How many 5-digit telephone numbers can be constructed using the digits 0 to 9, if each number starts with 45 and no digit appears more than once?

UNIT—V

34. If

$$\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$$

then find x.

35. If

$$A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$$

then find A^5.

SECTION—C

Answer *five* questions, selecting *one* from each Unit : 8×5=40

UNIT—I

36. *(a)* A trader mixes 26 kg of rice at ₹ 20 per kg with 30 kg of rice of other variety at ₹ 36 per kg and sells the mixture at ₹ 30 per kg. Find his profit and also the percentage of profit. 3+1=4

(b) Define rational number and write one example. Is 1·333 ... a rational number? Justify. 1+1+1+1=4

37. *(a)* The compound interest on a certain sum of money for 2 years is ₹ 208 and the simple interest for the same time at the same rate is ₹ 200. Find the interest rate. 4

(b) There are three numbers 17, 42 and 93. Find the largest number to divide all the three numbers leaving the remainders 4, 3 and 2 respectively at the end. 4

UNIT—II

38. *(a)* If 6 men and 8 boys can do a piece of work in 10 days while 26 men and 48 boys can do the same in 2 days. Find the time taken by 15 men and 20 boys to complete the work. 4

(b) If

$A = \{a, b, c, d\}$, $B = \{a, c, e, f\}$

find

$A \cup B$, $A \cap B$, $A \setminus B$ and $B \setminus A$ 1+1+1+1=4

39. *(a)* Simplify : 4

(i) $\left(\dfrac{5}{4^{-1} - 9^{-1}}\right)^{1/2}$

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

(b) 20 teachers in a school either teach mathematics or physics. 12 of them teach mathematics while 4 teach both the subjects. Find the number of teachers who teaches physics. Also find the number of teachers who teaches only mathematics not physics. 3+1=4

UNIT—III

40. (a) Write the condition for the pair of linear equations $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ be consistent. Solve $3x+2y=9$ and $5x+y=10$. 1+3=4

(b) If the roots of the equation $(b-c)x^2+(c-2)x+(a-b)=0$ are equal, then prove that $2b=a+c$. 4

41. (a) The sum of the three numbers in AP is 21 and product of the first and third numbers of the AP is 45. What are the three numbers? 4

(b) In a two-digit number, the unit's digit is thrice the ten's digit. If 36 is added to the number, the digits interchange their place. Find the two-digit number. 4

UNIT—IV

42. (a) Simplify $(1+x)^n+(1-x)^n$ by using binomial expansion. 4

(b) Find the number of possible words that can be made using the word "EASYQUIZ" such that the vowels always come together. 4

43. (a) One card is drawn from a deck of 52 well-shuffled cards. Calculate the probability that the drawn card will be—

(i) an ace;

(ii) numbered card. 2+2=4

(b) Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. Find the probability that the ticket drawn has a number which is a multiple of 3 on 5. Also find the probability that the ticket drawn has a number which is neither multiple of 3 nor multiple of 5. 2+2=4

UNIT—V

44. (a) Let

$$A=\begin{pmatrix}1 & 2\\ 3 & 5\end{pmatrix} \text{ and } B=\begin{pmatrix}5 & -7\\ 2 & 3\end{pmatrix}$$

Find AB and A^{-1}. 2+2=4

(b) Solve the linear equations using matrices and determinants $2x - y = 5,\ x + y = 4$. 4

45. (a) Write the matrix

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$$

as a sum of symmetric and skew-symmetric matrices. 4

(b) Consider the matrix

$$P = \begin{bmatrix} 1 & 3 & 4 \\ 2 & 3 & 5 \\ 1 & 6 & 7 \end{bmatrix}$$

Apply the following operations on P and write the transformed matrix in each case : 1+1+1+1=4

(i) $R_1 \to R_1 + 2R_3$

(ii) $C_1 \to C_1 - 5C_2$

(iii) $C_2 \to C_2 - C_3$

(iv) $R_3 \to -\frac{3}{5}R_3$

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