विद्या सर्वार्थि साधिका

ANANDALAYA

PERIODIC TEST – 2

CLASS XI

Subject : Mathematics (041) M.M.: 80

Date : 23 – 09 – 2024 Time : 3 Hours

General Instructions:

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 source based/case based/passage based/integrated units of assessment of 4 marks each with sub-parts.
7. All Questions are compulsory. However, an internal choice in 2 questions of 2 marks, 2 questions of 3 marks and 2 Questions of 5 marks has been provided.

SECTION - A

1. Write the following set in the roster form: $\left\{x: x = \frac{1}{2n-1},\ n \in N \text{ and } 1 < n \leq 5\right\}$. (1)

   (A) $\left\{1, \frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \frac{1}{9}\right\}$ (B) $\left\{\frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \frac{1}{9}\right\}$

   (C) $\left\{\frac{1}{3}, \frac{1}{5}, \frac{1}{7}\right\}$ (D) $\{3,5,7,9\}$

2. Let $R = \{(x, y): x \text{ and } y \text{ are integers and } xy = 4\}$. Range of R is _____. (1)

   (A) $\{-4, -2, -1, 1, 2, 4\}$ (B) $\{-2, 2\}$

   (C) $\{-4, -2, -1, 0, 1, 2, 4\}$ (D) $\{1, -2, 2, 4\}$

3. Let the function $f: R \longrightarrow R: f(x) = x^2 + 1$, find the pre-image(s) of 10 . (1)

   (A) 3 (B) -3 (C) $3, -3$ (D) 11

4. If z is a complex number, $z + \bar{z}$ is always _____ (1)

   (A) purely real number (B) 0

   (C) purely imaginary number (D) $|z|$

5. Which of the following is a finite set? (1)

   (A) Set of concentric circles in a plane (B) $\{x \in R: 0 \leq x < 3\}$

   (C) $\{x \in N: x > 5\}$ (D) $\{x \in W : x \leq 7\}$

6. Evaluate: $\sqrt{-16} + 3\sqrt{-25} + \sqrt{-36} - \sqrt{-625}$. (1)

   (A) 0 (B) 1 (C) $50i$ (D) $25i$

7. Solve the inequality, $3x - 5 < x + 7$, when x is a whole number. (1)

   (A) $[0, 5]$ (B) $(0, 5)$ (C) $\{1, 2, 3, 4, 5\}$ (D) $\{0, 1, 2, 3, 4, 5\}$

8. There are four routes between Anand and Delhi. In how many different ways can a person go from Anand to Delhi, if for return journey same route is not taken? (1)

   (A) 16 (B) 4 (C) 12 (D) 7

9. How many three digits odd numbers can be formed by using the digits 1, 2, 3, 4, 5, 6 when the repetition of digits is not allowed? (1)

(A) 125 (B) 48 (C) 60 (D) 75

10. Find the 10th term of the GP $\frac{1}{4}, -\frac{1}{2}, 1, -2, \ldots\ldots\ldots\ldots$ (1)

(A) 128 (B) -128 (C) -512 (D) -64

11. For what value of x are the numbers $(x+9), (x-6)\ and\ 4$ in GP? (1)

(A) 0 and 16 (B) 16 only (C) 4 (D) ± 4

12. The value of $\sin 80° \cos 20° - \cos 80° \sin 20° =$ _____. (1)

(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$ (C) $\frac{\sqrt{3}}{2}$ (D) 0

13. The value of $\frac{\tan 69° + \tan 66°}{1 - \tan 69° . \tan 66°}$ = _____ (1)

(A) 1 (B) -1 (C) $\sqrt{3}$ (D) $\frac{1}{2}$

14. Find the sum to infinity of the GP; $-\frac{5}{4}, \frac{5}{16}, -\frac{5}{64}, \ldots\ldots\ldots\ldots\infty$ (1)

(A) 2 (B) 1 (C) -1 (D) $\frac{3}{2}$

15. Number of terms in the expansion of $\left(x - \frac{1}{y}\right)^{11}$, $y \neq 0$ is _____ (1)

(A) 11 (B) 12 (C) 13 (D) 22

16. The value of $\sqrt{-25} \times \sqrt{-9} =$ _____ (1)

(A) -15 (B) 15 (C) $15\,i$ (D) 225

17 The value of $3sin40° - 4\ sin^3 40° = ?$ (1)

(A) $\frac{1}{2}$ (B) $-\frac{\sqrt{3}}{2}$ (C) $\frac{1}{\sqrt{2}}$ (D) $\frac{\sqrt{3}}{2}$

18. Roster method to express the set $\{x: x = n^3, n \in N\ and\ x \leq 80\}$ is _____ (1)

(A) $\{8, 27, 64\}$ (B) $\{1, 8, 27, 64\}$ (C) $\{0, 1\ 8, 27, 64\}$ (D) $\{1, 8, 27, 64, 80\}$

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A).

(B) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(C) (A) is true but (R) is false.

(D) (A) is false but (R) is true.

19. Assertions (A) : $sin(x + y)\ cos(x - y) - cos(x + y)\ sin(x - y) = sin\ 2x$ (1)
Reason (R) : $sin\ A\ cos\ B - cos\ A\ sin\ B = sin(A - B)$

20. Assertions (A) : For the relation {(1, 2), (2, 3), (1, 5), (3, 4)} domain is {1, 2, 3}. (1)
Reason (R) : For a given relation R from set A to set B, given by R = {(a, b) ∈ A × B: a is related to b} the set of elements a ∈ A for (a, b) ∈ R is known as its domain.

SECTION - B

21. The 4th, 7th and 10th terms of a GP are a, b, c respectively. Prove that $b^2 = ac$. (2)

OR

If x, y, z are in AP and A_1 is the AM between $x\ and\ y$, A_2 is the AM between $y and\ z$ then prove that the AM between $A_1\ and\ A_2\ is\ y$.

22. In how many ways can the letters of the word 'PARALLEL' be arranged so that all L's do not come together? (2)

23. Find all consecutive even positive integers both of which are larger than 5 such that their sum is less than 23. (2)

OR

Solve the system of in-equations: $3x - 7 < 5 + x$, $11 - 5x \leq 1$.

24. Show that $(1-i)^n \left(1-\frac{1}{i}\right)^n = 2^n \; for \; all \; n \in N$. (2)

25. If the $function \;\; f: R \rightarrow R$ defined by (2)

$$f(x) = \begin{cases} 3x-2, & x < 0 \\ 1, & x = 0 \\ 4x+1, & x > 0 \end{cases}$$, Find $f(2),\ f(-2),\ f(0),\ f(3.5)$.

SECTION - C

26 If $A = \left\{\frac{1}{x} : x \in N, and \; x < 6\right\}$ and $B = \left\{\frac{1}{2x} : x \in N, and \; x \leq 3\right\}$, (3)

find (i) $A \cup B$ (ii) $A \cap B$ (iii) $B - A$ (iv) $A - B$

27 If $z = 2 - 3i$ show that $z^2 - 4z + 13 = 0$ (3)

28. Find domain and range of $f(x) = \frac{ax-b}{cx-d}$. (3)

OR

$If \;\; A = \{-2, -1, 0, 1, 2\}, \;\; B = \{-3, -1, 1, 5\}$. Define $f: A \rightarrow B$ by $f(x) = 2x^2 - 3$ for all $x \in A$. Is f a function? If so, find the range of f and pre images of 5 and -1.

29. Using binomial theorem, find the value of the following: $\left(\sqrt{3}+1\right)^5 + \left(\sqrt{3}-1\right)^5$. (3)

30. In how many different ways, the letters of the word ALGEBRA can be arranged in a row if (3)
(*i*) The two A's are together? (*ii*) The two A's are not together?

31 The sum of first three terms of a G.P. is 16 and the sum of next three terms is 128. Find the first term, the common ratio and the sum to *n* terms of a G.P. (3)

OR

If $x, 2y, 3z$ are in AP, where the distinct numbers x, y, z are in GP then find the common ratio of the GP.

SECTION - D

32. If $tanx = -\frac{3}{4} \; and \; \frac{3\pi}{2} < x < 2\pi$, find the values of (i) $sin2x$ (ii) $cos2x$ (iii) $tan2x$ (5)

33. Find the sum the following series up to *n* terms: $0.3 + 0.33 + 0.333 + \ldots\ldots\ldots$ (5)

OR

Find the value of *n*, so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be geometric mean between *a* and *b*.

34. Find the domain and range of $y = \frac{2}{9-x^2}$. (5)

35. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has at least one boy and one girl? (5)

OR

If $(2n-1)P_n : (2n+1)P_{n-1} = 22 : 7$, find n .

SECTION – E

This section comprises of 3 case- study/ passage-based questions of 4 marks each with sub parts. The first two case study questions have three sub parts (i), (ii), (iii) of marks 1, 1, 2 respectively. The third case study question has two sub parts of 2 marks each.

36. A code is to consist of two distinct letters followed by two distinct numbers between 1 to 9. For example, AB34 or DQ12 etc., are codes.

(i) How many such codes are possible? (1)

(ii) How many such codes can be formed starting with A? (1)

(iii) How many of them end with an even integer? (2)

OR

(iii) How many of them end with the digit 1?

37. One side of an equilateral triangle is 72 cm. The mid points of its sides are joined to form second triangle whose mid points, in turn, are joined to form third triangle. The process is continued indefinitely.

(i) Find the side of 10^{th} triangle (1)

(ii) Which triangle will be the first triangle having side less than 1 cm? (1)

(iii) Find the sum of perimeters of all the triangles (2)

OR

(iii) Find the sum of the areas of all triangles.

38. The given figure is to find the values of sine and cosine functions in second, third and fourth quadrants using their given values in first quadrant. Use the figure to solve the following questions.

(i) $sin120° \cos 330° + \cos 240° sin330° =$ _____ (2)

(ii) $sin^2\left(\frac{\pi}{6}\right) + cos^2\left(\frac{\pi}{3}\right) - tan^2\left(\frac{\pi}{4}\right) =$ _____ (2)

OR

(ii) $sin105° + \cos 105° =$ _____