



विद्या सर्वार्थ साधिका

ANANDALAYA
PERIODIC TEST – 2
Class: XI

Subject : Mathematics (041)
Date : 29-09-2023

M.M : 80
Time : 3 hours

General Instructions:

1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory.
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 sources 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 5 marks, 2 questions of 3 marks and 2 questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.

SECTION – A

1. The set $A = \{x \in N: x^2 - 4 = 0\}$ is _____. (1)
(A) $\{2\}$ (B) not a well defined set (C) $\{-2, 2\}$ (D) $\{-2\}$
2. Multiplicative inverse of $1 + i$ is _____. (1)
(A) $1 - i$ (B) $\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}i$ (C) $\frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}}i$ (D) $\frac{1}{2} - \frac{1}{2}i$
3. Number of terms in the expansion of $(x - 2y)^{10}$ are _____. (1)
(A) 10 (B) 12 (C) 11 (D) 20
4. If $R = \{(1, 3), (2, 5), (3, 5), (7, 4)\}$ is a relation, The number of elements its range contains are _____. (1)
(A) 1 (B) 2 (C) 3 (D) 4
5. Number of three letter words formed from the letters A, S, T, R and P and ending with T are _____. (1)
(A) 12 (B) 24 (C) 20 (D) 6
6. The nth term of a G.P. 1, 0.1, 0.01, 0.001, is _____. (1)
(A) $(0.1)^{n-1}$ (B) $(0.01)^n$ (C) $(0.1)^n$ (D) $(0.01)^{n-1}$
7. A wheel makes 270 revolutions in one minute. Through how many radians does it turn in one second? (1)
(A) 3π (B) 9π (C) 12π (D) 13π
8. What is the domain of $\sqrt{a^2 - x^2}$ ($a > 0$)? (1)
(A) $(-a, a)$ (B) $[-a, a]$ (C) $[0, a]$ (D) $(-a, 0]$
9. i^{257} in simplified form is _____. (1)
(A) 1 (B) -1 (C) i (D) $-i$
10. Solution of $11x < 101, x \in Z$ is _____. (1)
(A) $(-\infty, \frac{101}{11})$ (B) $[-\infty, \frac{101}{11}]$
(C) $\{\dots, -4, -3, -2, -1, 0, 1, 2, 3, \dots, 9\}$ (D) $\{1, 2, 3, 4, \dots, 9\}$
11. The set $\{2, 3, 5, 7, 11, 13\}$ in set builder form can be written as _____. (1)
(A) $\{x: x \text{ is a prime number}\}$ (B) $\{x: x \text{ is odd prime number} < 15\}$
(C) $\{x: x \text{ is a prime number} \leq 13\}$ (D) $\{x: x \text{ is a number having exactly 2 factors}\}$
12. How many chords can be drawn through 15 points on a circle? (1)

- (A) 15 (B) 300 (C) 210 (D) 105
13. If p is a GM between 0.008 and 0.2, then $p =$ _____ . (1)
 (A) 4 (B) 0.4 (C) 0.0016 (D) 0.04
14. If $|x - 1| > 5$, then $x \in$ _____. (1)
 (A) $(-4, 6)$ (B) $[-4, 6]$
 (C) $(-\infty, -4] \cup [6, \infty)$ (D) $(-\infty, -4) \cup (6, \infty)$
15. The sum to infinity of the G.P. $4, \frac{4}{3}, \frac{4}{9}, \dots$ is _____. (1)
 (A) 5 (B) $19/3$ (C) $16/9$ (D) 6
16. The real part of the complex number $z = \frac{3}{i}$ is _____. (1)
 (A) 0 (B) 3 (C) -3 (D) i
17. If $\tan \alpha = \frac{1}{2}$ and $\tan \beta = \frac{1}{3}$, then the value of $\alpha + \beta =$ _____. (1)
 (A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) 0 (D) π
18. Binomial coefficient of 7th term in the expansion of $(x + y)^7$ is _____. (1)
 (A) 7C_4 (B) 7C_5 (C) 7C_6 (D) 7C_7

In the following question numbers 19 and 20, 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. Assertion (A) : If $(x+3, 5) = (2, y-1)$ then $x = -1, y = 6$. (1)
 Reason (R) : If $(a, b) = (c, d)$, then $a + c = b + d$.
20. Assertion (A) : Fifth term in the expansion of $(x + \frac{1}{x})^{10}$ is ${}^{10}C_5 x^5 (\frac{1}{x})^5$. (1)
 Reason (R) : Coefficients of second term in the expansion of $(x + y)^n$ is nC_1 .

SECTION – B

21. If $A = \{1, 2, 3\}$ and $B = \{3, 4\}$ and $C = \{1, 3, 5\}$ find $A \times (B \cap C)$. (2)
22. (a) If ${}^nP_r = 336, {}^nC_r = 56$. Find n and r . (2)
- OR**
- (b) How many different numbers of 6-digit (without repetition of digit) can be formed from the digits, 3, 1, 7, 0, 9, 5? (2)
23. Find the value of $\cos 25^\circ 35' \cos 34^\circ 25' - \sin 25^\circ 35' \sin 34^\circ 25'$.

24. Express $\frac{3-i}{5+6i}$ in the form of $(a + ib)$. (2)
25. (a) The 4th, 7th and 10th term of a GP are a, b and c respectively. Show that $b^2 = ac$. (2)
- OR**
- (b) If a, b, c and d are in GP, prove that $(b - c)^2 + (c - a)^2 + (d - b)^2 = (a - d)^2$.

SECTION – C

26. (a) Let $f: R \rightarrow R$ be given by $f(x) = x^2 + 3$. (3)
 Find: (i) x , for $\{x: f(x) = 28\}$
 (ii) the pre-images of 39 and 2 under 'f'.
- OR**
- (b) Let $f = \left\{ \left(x, \frac{x^2}{1+x^2} \right) : x \in R \right\}$ be a function from R to R . Determine the Domain and range of f .

27. Using binomial expansion find the value of $(51)^4$. (3)

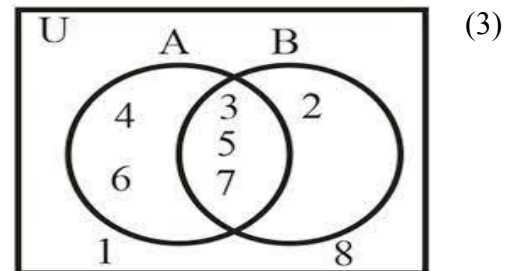
28. (a) Evaluate: $\left[i^{18} + \left(\frac{1}{i}\right)^{25}\right]^3$. (3)

OR

(b) If $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3 = x + iy$. Find $x + y$.

29. From the given Venn diagram, determine the following sets:

- (i) $A \cup B$
- (ii) $A \cap B$
- (iii) $A - B$
- (iv) $(A \cap B)'$
- (v) B'
- (vi) A'



30. Find the value of (3)

$$\cos\left(\frac{3\pi}{2} + A\right) \cdot \cos(2\pi + A) \left[\cot\left(\frac{3\pi}{2} - A\right) + \cot(2\pi + A) \right].$$

31. Expand using binomial expansion $(1 - x + x^2)^4$. (3)

SECTION - D

32. (a) Prove that: $\sin 5A = 5 \sin A - 20 \sin^3 A + 16 \sin^5 A$. (5)

OR

(b) Prove that: $\cos^2 \frac{\pi}{8} + \cos^2 \frac{3\pi}{8} + \cos^2 \frac{5\pi}{8} + \cos^2 \frac{7\pi}{8} = 2$.

33. Three friends were having get together. Suddenly they decided to play with their names using sets. Name of friends were AARTI, CHARVI and AYUSH. They asked each other the following questions. (5)

- (i) Write the set of letters forming the name 'AARTI' in roster form?
- (ii) What is the difference of set of letters of CHARVI and AYUSH?
- (iii) Write a union of sets taking the letters of names of friends.
- (iv) Form a set of intersection of sets taking the letters of names of friends.
- (v) Draw a Venn diagram for the given three sets.

34. The Arithmetic Mean (AM) of two positive numbers a and b ($a > b$) is twice their Geometric Mean (GM). Prove that $a : b = 2 + \sqrt{3} : 2 - \sqrt{3}$. (5)

35. (a) What is the number of way of choosing 4 cards from a pack of 52 playing cards? In how many of these; (5)

- (i) four cards are of the same suit?
 - (ii) four cards belong to four different suits?
 - (iii) are face cards?
 - (iv) cards are of the same colour?
- (Write answer in simplest form for above all questions)

OR

(b) Find the number of arrangements of the letter of the word CHANDRAYAAN. Also find the number of arrangements, if

- (i) the words starts with C?
- (ii) all the vowels always occur together?
- (iii) all the vowels never occur together?
- (iv) the words begin with H and end with C?

SECTION – E

36. In a school, for all the classes a student is given a unique natural number, known as roll number of the student. We can consider the above situation from “students of a class” to the set of natural numbers. Considering that there are 38 students in a class. Answer the following: (4)

- (i) Is relation from “Students of a class” to a set of natural numbers, a function?
- (ii) How many elements are there in range of a relation?
- (iii) For the above relation what is the domain of the relation?

OR

- (iii) Is range equal to set of natural number?

37. The marks of four students out of 100 in 4 tests are given below and the grading scheme is also given. Read the given information carefully and answer the following: (4)

Student’s score card				
Name	Test – 1	Test – 2	Test – 3	Test – 4
Prachi	85	93	94	89
Fatima	75	86	76	75
Alex	92	83	44	60
Gurpreet	59	81	62	73

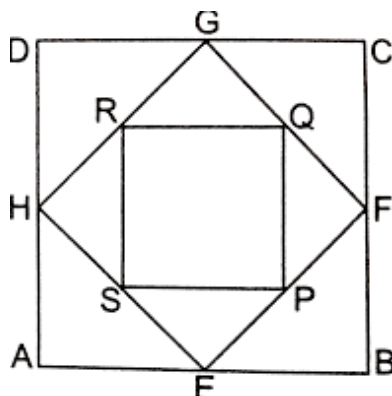
Grade system	
Average Marks (x)	Grade
$x \geq 91$	A ₁
$90 \geq x \geq 81$	A ₂
$80 \geq x \geq 71$	B ₁
$70 \geq x \geq 61$	B ₂
$60 \geq x \geq 51$	C

- (i) To get grade A₁, find the minimum marks Prachi should score in test – 5.
- (ii) Find the marks Fatima should score in test – 5 to get grade A₂.
- (iii) If Alex score 91 marks in his test – 5, then which grade he will get?

OR

- (iii) If Fatima was not able to take test – 5 as she was ill and teacher gives her average of 4 test in the test – 5, then which grade she will get?

38. Geometrical mathematics has helped in art integration in the formation of designs of different patterns. Let us consider a square pattern. The mid points of whose sides are again joined to form another square and in turn its mid-points of sides are again joined to form another square and the process continues infinitely. The pattern looks like as shown below:



If sides of original square ABCD is 100 cm then answer the following:

- (i) What is the length of the side of square EFGH?
- (ii) What is the perimeter of the square PQRS?
- (iii) Find the length of the side of the sixth square formed.

OR

- (iii) Find the length of side of the seventh square formed.