CLASS XI MATHEMATICS (041)
MID - TERM EXAMINATION 2024 - 25

Name-

Weightage: Roll No-

Time Duration 70 marks.

3 hrs

GENERAL INSTRUCTIOS:

1.this question paper contains **five sections – A, B, C, D and E.** Each part is compulsory. However, there is an internal choice in some questions

2.**Section A** has 17 multiple choice questions of 1 mark each

3.**Section B** has 5 very **short answer type (VSA) type questions** of 2 marks each.

4. **Section C** has 5 **short answer type questions (SA)** of 3 marks each.

5. **Section D** has 4 **long answer type questions (LA)** of 5 marks each.

6.Section E has 2 case based/source-based questions of 4 marks each with sub- parts

SECTION - A

1. How many three digit numbers are there with all distinct digits1,2,3,4,5,6,7,8,9,0

(a) 548 (b) 648 (c) 560 (d) None

2. If $i^{103} = a + ib$ then a +b is equal to

(a) 1 (b) -1 (c) 2 (d) None

3..Set of even prime numbers is

(a) Null set (b) a singleton set (c) a finite set (d) an infinite set

4. The set of circles passing through the origin (0,0)

(a)Finite set (b) infinite set (c) Null set (d) none of these

5. Let A and B be two sets in the same universal set. Then A-B =

(a) $A \cap B$ (b)$A' \cap B$ (c) $A \cap B'$ (d)none of these

6.Two sets A, B are disjoint if :

(a) $A \cup B = \emptyset$ (b) $A \cap B \neq \emptyset$ (c)$A \cap B = \emptyset$ (d)A-B=A

7.Set A and B have 3 and 6 elements respectively. Minimum elements in $n(A \cup B)$ is

(a) 3 (b) 6 (c) 9 (d) 18

8.If R is a relation defined from the set B to the set A as R:B ->A ,

(a) $R = A \cup B$ (b) $R = A \cap B$ (c) $R \subset A \times B$ (d) $R \subset B \times A$

9. Let A = {1, 2, 3,} , relation R is defined as R:A→A. Total number of relation will exist is

(a) 8 (b) 512 (c) 32 (d) None

10. The Range of the function f(x) = |x + 2 | is ;

(a) (- ∞, 0) (b) [0, ∞) (c) (0, ∞) (d) R

11. Let A = {x, y} and B = {1, 2} then number of non-empty relations from set A to set B will be

(a) 64 (b) 32 (c) 16 (d) 15

12. The function f: R⟶R, f (x) =[x], x ∈ R, [x] define the greatest integer less than or equal to x.

then f(−3/2) is equal to

(a) - 3 (b) - 2 (c) - 1.5 (d) None of these

13. The value of Cos (- 1710^0) is

(a) 1 (b) 0 (c) 1/2 (d) None

14. Value of $(1 + i)^4$ X $(1 + \frac{1}{i})^4$ is:

(a) 4 (b) 8 (c) 16 (d) 32

15. Range of the function f(x) = 2 - 3x , x > 0 is:

(a) (2, ∞) (b) (− ∞ , 2) (c) [2, ∞) (d) (- ∞ , 2]

Direction: **In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Answer the questions selecting the appropriate option**

(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) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

16.**ASSERTION(A):** U = {1, 2, 3, 4, 5, 6, 7, 8, 9}, B = {2, 4, 6, 8}, A = { 1, 3, 5, 7} , then $(A \cup B)' = \{9\}$

REASON(R): $(A \cup B)'$ is the set of elements which belong to ($A \cup B$) but does not belong to U

17.**ASSERTION(A):** If U = { 1, 2,3, 4, 5}, A = {1, 2, 3}, B = {3, 4, 5}, C = {2, 3}, then A – (B∩ C) = {1, 2}

REASON(R): A– (B∩ C) is the set of all elements which belongs to A but does not belong to B∩ C

SECTION – B

18. Prove that, $\cos 60^0 + \cos 120^0 + \cos 240^0 - \sin 330^0 = 0$

19. Insert 4 Geometric means between 1 and 243

OR

The first term of a G.P is 1 and the sum of third and fifth term is 90. Find the common ratio of G.P

20. Find the value of a and b if $\left(\frac{1+i}{1-i}\right)^{100}$ = a + i b

21. Let f be the subset of Z X Z defined by f = {(ab, a + b) : a ,b ϵ Z) . Is f a function from Z to Z? Justify your answer.

22. Find the multiplicative inverse of $(3i - 1)^2$

SECTION - C

23. Prove that $(\text{Cos } x + \text{Cos } y)^2 + (\text{Sin } x - \text{Sin } y)^2 = 4\,\text{Cos}^2\frac{x+y}{2}$

24. If a, b, c are in A.P; b, c, d are in G.P; and 1/c, 1/d, 1/e are in A.P; Prove that a, c, e are in G.P.

25. If $(x + iy)^3 = u + iv$, Prove that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$

26. The sum of first three terms of a G.P. is 16 and the sum of the next three terms is 128.

Determine the first term, the common ratio and the sum to n terms of the G.P

OR

If a, b, c, d are in G.P, Prove that $(a^n + b^n)$, $(b^n + c^n)$, $(c^n + d^n)$ are in G.P.

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

SECTION - D

28. 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 (i) no girl? (ii) exactly three girls? (ii) at least 3 girls?

29. Prove that $\text{Cos}^2x + \text{Cos}^2(x + \pi/3) + \text{Cos}^2(x - \pi/3) = 3/2$

OR

Prove that $\text{Cos } 2x\ \text{Cos } (x/2) - \text{Cos } 3x\ \text{Cos}(9x/2) = \text{Sin } 5x\ \text{Sin}(5x/2)$

30. Determine with explanation the range of the function f which is defined as $f = \{(x, \frac{x^2}{1+x^2}) : x \in R\}$

31. If $\tan x = 3/4$, $\pi < x < 3\pi/2$, Find the value of $\text{Sin}(x/2)$, $\text{Cos}(x/2)$, and $\tan(x/2)$

SECTION E (Case – Study based questions)

(1^{st} and 2^{nd} carry 1 mark each and 3^{rd} carry 2 marks)

32. Read the following passage and answer the questions given below. Every person has

Independence thought

Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements,

(i) Do the words start with P

(ii) Do all the vowels always occur together

(iii) Do the vowels never occur together

OR

Do the words begin with I and end in P?

33. We know that

$\sin(A+B) = \sin A \cos B + \cos A \sin B$

$\sin (A - B) = \sin A \cos B - \cos A \sin B$

$\cos (A + B) = \cos A \cos B - \sin A \sin B$

$\cos (A - B) = \cos A \cos B + \sin A \sin B$

Using the above formulae

(i)Obtain the formula for $2 \sin A \cos B$

(ii) Obtain the formula for $2 \cos A \cos B$

(iii)Obtain the formula for $2 \sin A \sin B$

OR

Obtain the formula for $\sin 2A$ and $\cos 2A$