Grade : 11 | Term- I | Marks: 80

Date : 19.09.2023 | MATHEMATICS(041) | Time : 3 hrs

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.

Section A

1. The value of $\sin\frac{31\pi}{3}$ is

(a)$\frac{1}{2}$ (b)$\frac{\sqrt{3}}{2}$ (c)$\frac{1}{\sqrt{2}}$ (d)1

2. If$(2x, y-x) = (y+3, 0)$then the value of y is

(a)3 (b)-3 (c)x (d)-x

3. Find the range of $f(x) = \frac{x-2}{x-1}$

(a)R (b)$R - \{1\}$ (c)$R - \{-1\}$ (d)None

4. For set A, $A \cup A = A$, This is

(a)Law of U (b)Law of identity element

(c)Idempotent law (d)Commutative law

5. The modulus of $6 - i$

(a)37 (b)$6 + i$ (c)6 (d)$\sqrt{37}$

6. If $a + ib = c + id$ then

(a)$a^2 + b^2 = 0$ (b)$c^2 + b^2 = 0$

(c)$d^2 + b^2 = 0$ (d)$a^2 + b^2 = c^2 + d^2$

7. If $-3x + 17 < -13$, then

(a) $x \in (10, \infty)$ (b) $x \in [10, \infty)$ (c) $x \in (-\infty, 10]$ (d) $x \in [-10,10]$

8. The number of 6 digit numbers, all digits of which are odd is

(a)5^6 (b)5^5 (c)6^5 (d)6^6

9. If $\left(\frac{1+i}{1-i}\right)^m = 1$, then the least positive integral value of m is

a) 0 b) 1 c) 2 d) 4

10. If B = { x: x is a student presently studying in both classes X and XI }. Then , the number of elements in set B are

a) finite b) infinite c) zero d) none of these

11. If f : R →R is defined by f(x) =3x+|x| , then f(2x)-f(-x) -6x =

a) f(x) b) 2f(x) c) –f(x) d) f(-x)

12. If $\left(\frac{1-i}{1+i}\right)^{100}$=a+ib then

a) a=2, b= -1 b) a=1, b=0 c) a=0 , b= 1 d) a= -1 , b=2

13. If $\frac{5-2x}{3} \leq \frac{x}{6} - 5$, then x ϵ

a) [2,∞) b) [-8,8] c) [4, ∞) d) [8, ∞)

14. If $30\ C_{r+2} = 30\ C_{r-2}$, then r equal to

a) 8 b) 15 c) 30 d) 32

15. How many terms are present in the expansion of (x-2y)^7 ?

a) 6 b) 7 c) 8 d) 9

16. If f(x) = x^3 - $\frac{1}{x^3}$, then f(x) + f($\frac{1}{x}$) is equal to

a) 2x^3 b) $\frac{2}{x^3}$ c) 0 d) 1

17. If ∅ denotes the empty set, then which one of the following is correct ?

a) ∅ ∈ ∅ b) ∅ ∈ {∅} c) {∅} ∈ {∅} d) 0∈ ∅

18. 1+i^2+i^3+i^4+…+i^{2n} is

a) positive b) negative c) 0 d) cannot be determined

Assertion-Reason based Questions

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. **Assertion (A):** A total of 360 words can be generated using all the letters of 'BHARAT' (with or without meaning)
Reason(R) :Total no. of combinations of n different things taken r at a time is given by n_{C_r}.

20. Assertion(A) :An angle of **11/7** is equivalent to 90^0.
Reason (R): Angle in radian =Angle in degree $\times \frac{\pi}{180°}$

Section B

21. Write the following sets in roster form:
(i) A = {x : x is an integer and –3 ≤ x < 7}
(ii) B = {x : x is a natural number less than 6}

(OR)

If the ordered Pairs (x−1,y+3) and (2, x+4) are equal, find x and y.

22. Evaluate $\tan 75^0$

23. The English alphabet has 5 vowels and 21 consonants. How many words with two different vowels and 2 different consonants can be framed from the alphabet?

24. Solve the given linear inequalities 3x-2 < 2x+1 and show the graph of the solution in the number line.

25. Expand the expression $(2x-3)^6$ using the binomial theorem.

SECTION C

26. Find the number of different words that can be formed from the letters of the word TRIANGLE, so that no vowels are together.

27. In how many ways can a football team of 11 players be selected from 16 players? How many of them will (i) include 2 particular players? (ii) exclude 2 particular players?

28. Given A = {1,2,3,4, 5}, S= {(x , y) :x∈ A, y∈ A}.Find the ordered pairs which satisfy the conditions given below (i) x+y = 5 (ii) x+y<5 (iii) x+y>8

29. If a cos θ + b sin θ =m and a sin θ - b cosθ = n, then show that $a^2 + b^2 = m^2 + n^2$

(OR)

Evaluate : $\sum_{n=1}^{13}(i^n + i^{n+1})$ where n ∈ N

30.If $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3$ =x+iy, then find (x,y)

31.Solve : $\frac{4}{x+1} \leq 3 \leq \frac{6}{x+1}$

Section D

32. If $\boldsymbol{\theta}$ lies in the first quadrant and cos$\boldsymbol{\theta}$ =8/17 , then find the value of cos (30° + $\boldsymbol{\theta}$) + cos (45° – $\boldsymbol{\theta}$) + cos (120° – $\boldsymbol{\theta}$).

33. Show that 2^{4n+4} -15n-16 where n ∈ N , is divisible by 225.

34. Let A = {1, 2, 3,4,5}, B = {4,,5,6} and C = {5,6,7}

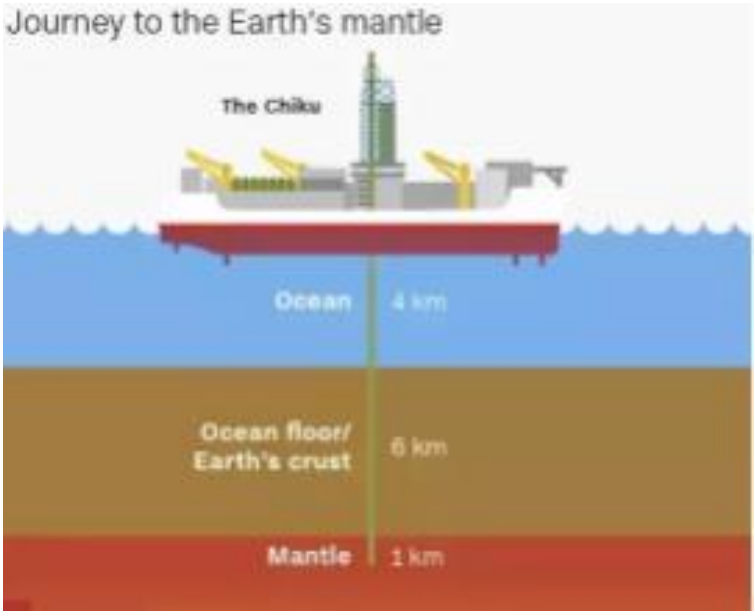
(i) Verify that: A x (B – C) =(A x B) – (A x C)

(ii) Find (A x B) ∩ (A x C).

35. If $\frac{(1+i)^2}{2-i}$= x+iy, then find the value of x+y.

SECTION E

36. **In drilling world's deepest hole, the Kola Superdeep Borehole, the deepest manmade hole on Earth and deepest artificial point on Earth, as a result of a scientific drilling project, it was found that the temperature T in degree Celsius, x km below the surface of Earth, was given by:**



T = 30 + 25 (x – 3), 3 < x < 15. If the required temperature lies between 200^o C and 300^o C, then

i) the depth, x will lie between

a) 9 km and 13 km b) 9.8 km and 13.8 km

c) 9.5 km and 13.5 km d) 10 km and 14 km

(ii) Solve for x. -9x+2> 18 OR 13x+15 ≤−4

a) x ≤ −19/ 13 b) x < −16/ 13 c) −16/13 < x < −19/13 d) no solution.

(iii) If |x| < 5 then the value of x lies in the interval

a) (-∞, -5) b) (∞, 5) c) (-5, ∞) d) (-5, 5)

37. Five students Ajay, Syam, Rahul ,Ravi and Deepak are getting bored of their regular study. They go to playground and sit in a straight line.

On the basis of above information ,answer the following :

(i) Total number of ways of sitting arrangements of 5 students ?

(ii) In how many total number of sitting if Ajay and Ravi can sit together ?

38. Two non-empty sets A and B are given by A ={x : x is a letter in I LOVE MATHEMATICS } and B= { x: x is a letter in I LOVE STATISTICS}.

Based on the above information, answer the following questions

(i) which of the following is true?

a) A=B b) A ⊂ B c) B ⊂ A d) none of these.

(ii) A ∪B is equal to

a) A b) B c) $A \cap B$ d) ∅

(iii) B – A is equal to

a) A b) B c) A-B d) ∅

ALL THE BEST