Time allowed: 3 hours   **Maximum Marks: 80**

General Instructions

1. All questions are compulsory.
2. The question paper consists of 36 questions divided into 4 Sections A,B,C and D. Section A comprises of 20 questions of 1 Mark each, Section B comprises of 6 questions of 2 Marks each, section C comprises of 6 questions of 4 Marks each and section D comprises of 4 questions 6 Marks each.
3. All questions in Section A are to be answered in one word , one sentence or as per the exact requirement of the question.
4. There is no overall choice. However internal choice has been provided in Section B , C and D.

Section A

From question 1-10 choose the correct answer from the given options.

1. For any two sets A and B , $A \cap (A \cup B)'$ is equal to

    a) A   b) B   c) $\emptyset$ d) $A \cap B$

2. In set builder method the null set is represented by

    a) { }   b) $\emptyset$ c) $\{ x : x \neq x \}$ d) $\{ x : x = x \}$

3. If A and B are two sets such that n (A) = 70, n(B)=60, n(A∪B) = 110 , then n(A∩B) is equal to

    a) 240   b) 50   c) 40   d) 20

4. Let R be a relation from a set A to a set B , then

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

5. If R is a relation on a finite set A having n elements, then the number of relations on A is

    a) 2^n b) 2^{n^2} c) n^2 d) n^n

6. The range of the function $f(x) = \frac{x}{|x|}$, x≠0 is

    a) R-{0}   b) R-{-1,1}   c) {-1,1}   d) None of these

7. If $\tan x = -\frac{1}{\sqrt{5}}$ and x lies in the IV Quadrant, the value of $\cos x$ is.

    a) $\sqrt{\frac{5}{6}}$ b) $\frac{2}{\sqrt{6}}$ c) 1/2   d) $\frac{1}{\sqrt{6}}$

8. Which of the following is incorrect

    a) $\sin x = -\frac{1}{5}$ b) $\cos x = 1$ c) $\sec x = 1/2$ d) $\tan x = 20$

9. The value of $\cos 1^0 \cos 2^0 \cos 3^0$ ....$\cos 179^0$ is

    a) $\frac{1}{\sqrt{2}}$ b) 0   c) 1   d) -1

10. If A={2,3}, B={1,3,5}, number of relations from A to B will be

    a) 8   b) 6   c) 64   d) 36

Solve the following questions and give the answers

11. Find the value of $(1 + i)(1 + i^2)(1 + i^3)(1 + i^4)$.

12. Find the amplitude of $\frac{1}{i}$.

13. If $2x+3 \geq -5$ find x if x is negative integer.

14. If $-3x + 17 < -13$, find the solution if x is real number.

15. Find the number of ways to arrange all the letters of the words CHEESE .

16. If $^nC_{12} = {}^nC_8$, find the value of n .

17. Ravi obtained 70 and 75 marks in first two unit test. Find the number if minimum marks he should get in the third test to have an average of at least 60 marks.

18. Find the modulus of $\frac{1-i}{1+i}$.

19. Find the angle between the minute and hour hands of a clock at 8:30.

20. Find the value of $\sqrt{-2} \times \sqrt{-3}$.

Section B

21. Solve the following inequalities and represent the solution on number line.

$5 (2x – 7) – 3 (2x + 3) \leq 0$, $2x + 19 \leq 6x + 47$.

22. Find the range of the following functions

$$f(x) = \sqrt{9 - x^2}$$

23. Find radian measure corresponding to $(-47^\circ 30')$.

24. Express following complex number in the standard form of a+ib : $\dfrac{3-4i}{(4-2i)(1+i)}$

<div align="center">OR</div>

Find roots of the quadratic equation: $9 x^2 - 12 x + 20 = 0$.

25. Determine n if $^{2n}C_3 : {}^nC_3 = 11 : 1$

26. How many different words can be formed by using all the letters of the word PRAYAGRAJ?

<div align="center">**Section C**</div>

27. If for two sets A and B, P(A) = P(B). Show that A=B.

<div align="center">OR</div>

Let A,B and C be three sets such that $A \cup B = A \cup C$ and $A \cap B = A \cap C$. Show that B=C.

28. Find the **domain and range of function f given by**

$$f(x) = \frac{2x-3}{4-3x} .$$

29. Convert the complex number $\dfrac{-16}{1+i\sqrt{3}}$ into polar form.

<div align="center">OR</div>

Find the square root of -7-24i .

30. Solve the following system of linear inequalities graphically:

$x+2y \leq 10$; $x+y \geq 1$; $x-y \leq 0$; $x \geq 0, y \geq 0$

31. In how many ways can the letters of the word ASSASSINATION be arranged so that all the S's are not together?

32. Find the term independent of x in the expansion of $(3x^2 - \frac{1}{2x^3})^{10}$.

Section D

33. In a University, out of 100 students 15 offered Mathematics only; 12 offered Statistics only; 8 offered Physics only ;40 offered Physics and Mathematics;20 offered Physics and Statistics;10 offered Mathematics and Statistics;65 offered Physics. Find the number of students who

a) offered Mathematics

b) offered Statistics

c) did not offer any of the subjects

34. Find a,b and n in the expansion of $(a + b)^n$ if the first three terms of the expansion are 729,7290 and 30375 respectively.

OR

Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of $\left(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}}\right)^n$ is $\sqrt{6} : 1$.

35. Find $\sin\frac{x}{2}, \cos\frac{x}{2}$ and $\tan\frac{x}{2}$ when $tanx = -\frac{4}{3}$, x lies in II quadrant.

36. Prove following by using principle of mathematical induction for all $n \in N$.

$1.3+3.5+5.7+\ldots\ldots\ldots\ldots+(2n-1)(2n+1) = \frac{n(4n^2+6n-1)}{3}$.

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