Roll No.

MATHEMATICS

Time allowed: **3** *hours*   *Maximum Marks:* **100**

General Instructions:
 (i) **All** questions are compulsory.
 (ii) The question paper consists of **29** questions into three sections **A,B** and **C**. section **A** comprises of **10** questions of **one** mark each, section **B** comprises **12** questions of **four** marks each and Section **C** comprises of **07** questions of **six** marks each.
 (iii) **All** questions in Section **A** are to be answered in **one** word, **one** sentence or as per the exact requirement of the question.
 (iv) There is no overall choice. However, internal choice has been provided in **04** questions of **four** marks each and **02** questions of **six** mark each. You have to attempt only one of the alternatives in all such questions.
 (v) Use of calculators is **not** permitted. You may ask for logarithmic tables, if required.

SECTION – A

1. If A and B are two sets such that $A \subset B$. What is $A \cup B$?

2. Let A = {1,2} and B = {3,4} find the number of relations from A to B.

3. Convert $40^0 20$' into radian measure.

4. Express $i^9 + i^{19}$ in the form $a + ib$.

5. Evaluate $7! - 5!$.

6. Using binomial theorem, evaluate $(96)^3$.

7. Find first five terms of the sequence $a_n = 2^n$.

8. Find the equation of the circle with centre (-2, 3) and radius 4.

9. Find $\lim_{x \to 3}[x(x + 1)]$

10. A coin is tossed twice, what is the probability that at least one tail occurs?

SECTION – B

11. If U={1,2,3,4,5,6,7,8,9}, A={2,4,6,8} and B={2,3,5,7}. Verify that (i) $(A \cup B)' = A' \cap B'$ (ii) $(A \cap B)' = A' \cup B'$

12. Define greatest integer function. Draw the graph of it.
                 OR
    Define Modulus function. Draw the graph of it.

13. Prove that $\frac{sinx + sin3x}{\cos x + cos3x} = tan2x$.
              OR
    Prove that $cos^2 2x - cos^2 6x = sin4x\ sin8x$.

14. Prove that $x^{2n} - y^{2n}$ is divisible by $x + y$

15. Convert the given complex number " i " in the polar form.

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

Convert the given complex number " $-1 - i$ " in the polar form.

16. Solve the inequality $\frac{(2x-1)}{3} \geq \frac{(3x-2)}{4} - \frac{(2-x)}{5}$.

17. If ${}^{n}C_9 = {}^{n}C_8$, find ${}^{n}C_{17}$.

18. In an A P if m^{th} term is n and n^{th} term is m where $m \neq n$, find the pth term.

19. Find the equation of the hyperbola satisfying Foci ($\pm 5, 0$), the transverse axis is of length 8.

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

Find the equation of the ellipse with length of minor axis is 16, foci ($0, \pm 6$).

20. Find the coordinates of the points which trisect the line segment joining the points P(4, 2, -6) and Q(10, -16, 6).

21. Find $\lim_{x \to 0} f(x)$ and $\lim_{x \to 1} f(x)$, where $f(x) = \begin{cases} 2x + 3, & x \leq 0 \\ 3(x + 1), & x > 0 \end{cases}$

22. A card is selected from a pack of 52 cards. (i) How many points are there in the sample space? (ii) Calculate the probability that the card is an ace of spades. (iii) Calculate the probability that the card is (a) an ace (b) black card.

<div align="center">**SECTION – C**</div>

23. Find the general solution $sinx + sin3x + sin5x = 0$

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

Find the general solution $cos4x = cos2x$.

24. Prove by mathematical induction $1^2+3^2+5^2+\ldots\ldots\ldots+(2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$

25. Solve the system of inequalities graphically, $2x + y \geq 4, x + y \leq 3, 2x - 3y \leq 6$.

26. 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) at least one boy and one girl? (iii) at least 3 girls?

27. Find the middle term in the expansion of $\left(3 - \frac{x^3}{6}\right)^7$

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

Find the 13th term in the expansion of $\left(9x - \frac{1}{3\sqrt{x}}\right)^{18}$

28. If the 4th, 10th, 16th terms of G P are x, y, z respectively. Prove that x, y, z are in G P.

29. Find the derivative of $cosx$ from first principle.