SAMPLE PAPER - 2014
MATHEMATICS
Class – XI

General Instructions:-

- **All questions** are **compulsory.**

- This question paper consists of 26 questions divided into three sections.

  Section A comprises of 6 questions of **one mark** each, **Section B** comprises of 13 questions of **four marks** each and **Section C** comprises of 07 questions of **six marks** each.

- Use of **calculator** is **not allowed**.

- **Graph paper** will be provided.

Section A

1. If $A = \{2x: 1 \leq x < 4 \ and \ x \in N\}$ and $B = \{(x + 2): 2 \leq x < 5 \ and \ x \in N\}$, then find the set $A - B$.

2. If $A = \{a, b, c, d, e\}, B = \{a, c, e, g\}$ and $C = \{b, e, f, g\}$, then find $(A - B) \cup (A - C)$.

3. If $f(x) = x^3$ then find $\frac{\{f(5) - f(1)\}}{5 - 1}$.

4. Convert $-(22°30')$ into radians measure.

5. Find the modulus of 'z' if $z = \left(\frac{1+i}{1-i} - \frac{1-i}{1+i}\right)$.

6. Reduce $\left(\frac{1}{1-3i} - \frac{3}{1+2i}\right)$ to the standard form.

Section B

7. In a group of 850 persons, 600 can speak Hindi and 340 can speak Tamil. Find :
   (i) how many speak Hindi and Tamil both;
   (ii) how many speak Hindi only.
   (iii) how many speak Tamil only.

8. Let 'm' be a given fixed integer.

   Let $R = \{(a, b): a, b \in Z \ and \ (a - b) \ is \ divisible \ by \ m\}$. Show that R is an equivalence relation on Z.

9. Prove that $\tan\frac{\theta}{2} = \frac{1+\sin\theta-\cos\theta}{1+\sin\theta+\cos\theta}$

10. Find the domain of the real valued function $f(x) = \frac{x^2+2x+3}{x^2-5x+6}$.

11. If $f(x) = x^3 + 1 \ and \ g(x) = x + 1$ prove that $\left(\frac{f}{g}\right)(x) = x^2 - x + 1$.

   OR

   The function is defined by $f(x) = [x]$. Draw the graph of f(x).

12. Prove that: $\cos 5A = 16\cos^5 A - 20\cos^3 A + 5cosA$

OR

Prove that: $\cos^2 x + \cos^2(x + 120°) + \cos^2(x - 120°) = \frac{3}{2}$

13. Draw the graph of $y - 2 = 2\cos\left(x + \frac{\pi}{4}\right)$.

14. For all $n \in N$, prove that $1 + 4 + 7 \ldots \ldots \ldots + (3n - 2) = \frac{1}{2}n(3n - 1)$.

OR

Prove that:$(2n + 7) < (n + 3)^2$, for all natural numbers n.

15. Show that: $\frac{(1+i)(3+i)}{(3-i)} - \frac{(1-i)(3-i)}{(3+i)} = \frac{14}{5}i$

OR

If $(x + iy)^{\frac{1}{3}} = a + ib, x, y, a, b \in R$. Show that$\frac{x}{a} + \frac{y}{b} = 4(a^2 - b^2)$.

16. Convert the complex number $\frac{1+i}{1-i}$ to the polar form.

17. Solve the equation $25x^2 - 30x + 11 = 0$ by factorization method.

18. Solve ; $2x - 3 < x + 2 \leq 3x + 5, x \in R$ and show the solution set on the number line.

19. Solve: $\frac{5}{x-2} > 3$ and show the solution set, on the number line.

Section C

20. In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both H and T, 8 read both T and I, and 3 read all the three newspapers. Find

    (i)   the number of people who read at least one of the newspapers,

    (ii) the number of people who read exactly one of the newspapers

21. In any triangle ABC , prove that: $\frac{(b-c)}{(b+c)} = \frac{tan\frac{(B-C)}{2}}{tan\frac{(B+C)}{2}}$

OR

In any triangle ABC , prove that: $a\cos A + b\cos B + c\cos C = 2a\sin B \sin C$.

22. Find the general solution of the equation $\sin 3x + cos2x = 0$

23. Prove that : $(2^{3n} - 1)$ is divisible by 7.

24. If $(a + ib) = \sqrt{\frac{1+i}{1-i}}$, prove that $a^2 + b^2 = 1$.

OR

If $p + iq = \frac{a+ib}{c+id}$, then prove that: $(p^2 + q^2) = \frac{a^2+b^2}{c^2+d^2}$.

25. Solve: $x^2 + 13 = 4x$.

26. Solve the following system of inequations graphically.

    $6x + 5y \leq 150, \ x + 4y \leq 80, \ x \leq 15, \ x \geq 0, \ y \geq 0.$

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