

ANKITA HUI

XI

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Roll. No. .... Name .....

**NEW GREEN FIELDS SCHOOL**  
**HALF YEARLY EXAMINATION, 2015-16**  
**MATHEMATICS**

Time : 3 hrs.

Class - XI

M.M. :

**General Instructions—**

- (1) All questions are compulsory.
- (2) The question paper consists of 26 questions divided into three sections A, B & C. Section A comprises 6 questions of one mark each section B comprises 13 questions of four marks each & section C comprises 7 questions of 6 marks each.
- (3) There is no over all choice. However, internal choice have been provided in 4 questions of four marks each & 2 questions of 6 marks each.
- (4) Use of calculator is not permitted.

**SECTION—A**

- 1 Write the following sets in roaster form :  
 $A = \{x : x^4 - 5x^2 + 6 = 0\}$
- 2 Given  $\sin(A + B) = \frac{\sqrt{3}}{2}$  &  $\tan(A - B) = \frac{1}{\sqrt{3}}$ , find A & B.
- 3 Simplify :  
 $\sqrt{-4} \times (1 - \sqrt{-64})$
- 4 Find the multiplicative inverse of  $Z = 4 - 3i$ .
- 5 Find the slope of the line passing through the points  $(3, -2)$  &  $(-1, 4)$ .
- 6 Find the equation of the line which makes intercepts  $(-3)$  & 2 on the x & y axis respectively.

[P.T.O.]

## SECTION—B

Question numbers 7 to 19 carry 4 marks each.

7

Two finite sets have  $m$  and  $n$  elements. The total number of subset of the first set is 56 more than the total no. of subsets of the second set. Find the values of  $m$  &  $n$ .

8

Let  $f = \{(1, 1), (2, 3), (3, 5), (4, 7)\}$  be a function from  $Z$  into  $Z$  defined by  $f(x) = ax + b$  for  $a, b \in Z$ . Determine  $a$  &  $b$ .

9

If  $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ ,  $A = \{2, 4, 6, 8\}$  &  $B = \{2, 3, 5, 7\}$ , verify that—

(a)  $(A \cup B)' = A' \cap B'$

(b)  $(A \cap B)' = A' \cup B'$

10

Prove that :

$$\tan 50^\circ = 2 \tan 10^\circ + \tan 40^\circ$$

11

If  $(x + iy)^3 = a + ib$ ,  $x, y, a$  &  $b \in R$ . Show that :

$$\frac{x}{a} + \frac{y}{b} = 4(a^2 - b^2)$$

12

Prove that :

$$\cos 2\theta \cdot \cos \frac{\theta}{2} - \cos 3\theta \cdot \cos \frac{9\theta}{2} = \sin 5\theta \cdot \sin \frac{5\theta}{2}$$

13

Solve the trigonometrical equation :

$$\cos \theta + \cos 3\theta - 2 \cos 2\theta = 0$$

OR

Solve :

$$\sqrt{3} \cos \theta + \sin \theta = \sqrt{2}$$

14

If  $\frac{(a+i)^2}{2a-i} = p + iq$ , show that :

$$p^2 + q^2 = \frac{(a^2 + 1)^2}{4a^2 + 1}$$

OR

If  $x + iy = \sqrt{\frac{a+ib}{c+id}}$ , then prove that :

$$(x^2 + y^2)^2 = \frac{a^2 + b^2}{c^2 + d^2}$$

15

Write  $Z = \frac{i-1}{\cos \frac{\pi}{3} + i \sin \frac{\pi}{3}}$  into the polar form.

16

If  $|z| = 1$ , prove that  $\frac{z-1}{z+1}$  ( $z \neq -1$ ) is purely imaginary number. What can you conclude  $\frac{z}{z+1}$

$z = 1$ .

OR

For what values of  $x$  &  $y$  are the numbers  $3 + ix^2y$  &  $x^2 + y + 4i$  conjugate complexes ?  
 $x, y$  are reals.  $\frac{z}{z+1}$

17

Find the coordinates of the foot of the perpendicular from the point  $(-1, 3)$  to the line  $3x - 4y - 16 = 0$ .  $(-1, 2)$

OR

Find the distance of the line  $4x - y = 0$  from the point  $(4, 1)$  measured along the line making an angle of  $135^\circ$  with positive  $x$ -axis.

18

Find the equation of the line passing through the point  $(2, 2)$  & cutting off intercepts on the axis whose sum is 9.

19

Find the equation of the line passing through the intersection of the lines  $4x + 7y - 3 = 0$  &  $2x - 3y + 1 = 0$  that has equal intercept on the axis.

## SECTION—C

Question numbers 20 to 26 carry 6 marks each.

20

Solve :

$$x^2 - (\sqrt{3} - 2\sqrt{2}i)x - 2\sqrt{6}i = 0$$

21

By using the principle of mathematical induction prove that  $2 \cdot 7^n + 3 \cdot 5^n - 5$  is divisible by 24 for all  $n \in \mathbb{N}$ .

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OR

Prove that :

$$\sum_{i=1}^{n-1} t(t+1) = \frac{n(n-1)(n+1)}{3} \quad \forall n \geq 2, n \in \mathbb{N}$$

- 22 Find the value of—

(a)  $\tan \frac{\pi}{8}$

(b)  $\tan \frac{5\pi}{12}$

23 Prove that :

$$\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$$

24 In a town of 10,000 families, it was found that 40% families buy newspaper A, 20% newspaper B & 10% newspaper C, 5% families buy A & B, 3% buy B & C & 4% buy A & C. If 2% families buy all the three newspapers, find the number of families which buy—

(a) A only

(b) B only

(c) None of A, B & C

25 (a) Find the domain and the range of the function  $f(x) = \sqrt{16-x^2}$ .

(b) Draw the graph of the function :

$$f(x) = \begin{cases} 1-x & , x < 0 \\ 1 & , x = 0 \\ x+1 & , x > 0 \end{cases}$$

- 26 Find the image of the point (3, 8) with respect to the line  $x + 3y = 7$  assuming that the line to be a plane mirror.

OR

∞ A line is such that its segment between the lines  $5x - y + 4 = 0$  &  $3x + 4y - 4 = 0$  is bisected at the point (1, 5). Obtain its equation.