SOUNDARYA CENTRAL SCHOOL
Affiliated to CBSE –New Delhi

Mid term Examination-2019-2020

Grade XI **Subject : Mathematics** **Marks : 80**

General Instruction **Duration:3 hr**

- **All questions are compulsory.**
- **Section A :Question number 1 to 20 carries 1 mark.**
- **Section B :Question number 21 to 26 carries 2 mark.**
- **Section C :Question number 27 to 32 carries 4 mark.**
- **Section D :Question number 33 to 36 carries 6mark.**

Section-A **20x 1=20**

1) The value of $arg(x)$, when $x < 0$ is
   a)0 b)$\pi/2$ c)π d)None of these

2) If $|x-1| > 5$ then
   a)$x\epsilon(-4,6)$ b)$x\ \epsilon\ (-\infty,-4) \cup (6,\infty)$ c)$x\epsilon[-4,6]$ d)$x\epsilon(-\infty,-4) \cup [6,\infty]$

3) Multiplicative inverse of 4-3i is
   a)$\frac{1}{4+3i}$ b)$\frac{4+3i}{25}$ c)$\frac{1}{3-4i}$ d)$\frac{4-3i}{25}$

4) The value of x for which the points (x,-1), (2,1) & (4,5) are collinear, will be
   a)1 b)0 c)2 d)3

5) If cosA=1/3, then value of cos2A is:
   a)-5/9 b)-7/9 c)-1 d)2/6

6) Which of the following is not correct?
   a)$\sin\frac{-1}{5}$ b)$\cos\theta = 1$ c)$\sec\theta = \frac{1}{2}$ d)$\tan\theta = 2\theta$

7) Slope of a line which cuts off intercepts of equal lengths on the axes is
   a)-1 b)0 c)2 d)$\sqrt{3}$

8) If f : R→ R given by f(x) $= x^2 + 3$, then pre image of 2 under f is:
   a)7 b)5 c)-1 d)does not exist.

9) Value of $sin\frac{7\pi}{12}\cos\frac{\pi}{4}$ - $\cos\frac{7\pi}{12}\sin\frac{\pi}{4}$ is
   a)$\sqrt{3}$ b)$\frac{1}{\sqrt{3}}$ c)$\frac{1}{2}$ d)$\frac{\sqrt{3}}{2}$

10) Each set X_r contains 5 elements and each set Y_r contains 2 elements and $\bigcup_{r=1}^{20} X_r = S = \bigcup_{r=1}^{n} Y_r$. If each element of S belongs to exactly 10 of the $X_r's$ and to exactly 4 of the $Y_r's$ then n is equal to:

a)10 b)20 c)100 d)50

11) Let $f = \left\{\left(x, \frac{x^2}{1+x^2}\right) : x \in R\right\}$ be a function from R to R, determine the range of R.

12) If x≠ 1 and $f(x) = \frac{x+1}{x-1}$ then find the value of $f\{f(2)\}$

13) Value of x and y if x + 4iy = ix + y +3

OR

Solve the inequality $\frac{1}{x-4} < 0$

14) Express $i^9+i^{10}+i^{11} + i^{12}$ in the form of a + i b

15) The slope of the line passing through origin and the midpoint of the line segment joining points (0,-4) and (8,0) is

16) Find the general solution for $sin5\theta = \frac{1}{\sqrt{2}}$

17) A and B are two sets such that A $\subset B$, find the value of A $\cup B$

18) Let $A = \{x: x \text{ is a positive integer } < 8 \text{ and } x \text{ is a multiple of } 3 \text{ or } 5\}$ and $B = \{x: x \text{ is an even number} \leq 7\}$ Find (A-B) $\cap B$

19) Write the set A=$\{\pm1, \pm2, \pm3, \pm4, \pm5, \pm6\}$ in set builder form.

20) If $A = \{x, y, z\}$ and $B = \{1,2\}$ then number of relation from A to B is.

Section- B **6x 2=12**

21) Find the real numbers x and y if (x-iy)(3+5i) is the conjugate of (-1-3i)

OR

Line through the points (-2,6) and (4,8) is perpendicular to the line through the points (8,12) and (x,24). Find the value of x.

22) If A+B = $\frac{\pi}{4}$, find the value of (1+tanA) (1+tan B)

23) Draw the graph of the function f(x) = |x-2|, x$\in R$ write its domain and range

24) Solve for $x \in \mathbb{C} : 2x^2 + 3ix + 2 = 0$

OR

Polar representation of a complex number is (3,-45°) then find the complex number in standard form.

25) Prove that $\frac{sin\, x - sin\, 3x}{sin^2x - cos^2x}$ = 2sinx

OR

Solve 5(2x-7)-3(2x+3) ≤ 0 and 2x+19 ≤ 6x + 47 and represent the solution on number line

26) Represent the following sets in Venn diagram

i)$A' \cap (B \cup C)$ ii) $A' \cap (C - B)$

Section- C **6 x 4= 24**

27) Using the principle of mathematical induction, prove that

$$1 + \frac{1}{1+2} + \frac{1}{1+2+3} + \frac{1}{1+2+3+4} + \cdots + \frac{1}{1+2+3+\cdots+n} = \frac{2n}{n+1} \ \forall\, n \in N$$

OR

Using the principle of mathematical induction, prove that
$10^{2n-1} + 1$ is divisible by 11

28) Find modulus and argument of the complex number $\dfrac{i-1}{\cos\frac{\pi}{3}+i\sin\frac{\pi}{3}}$

29) For any two sets A & B prove that $P(A \cap B) = P(A) \cap P(B)$

30) Draw the graph of $\tan x$ function , write its domain and range.

OR

Define Greatest integer function, Draw the graph . Write its domain and range.

31) If the angle between two lines is $\frac{\pi}{4}$ and slope of one of the lines is $\frac{1}{2}$, find the slope of the other line.

32) A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 litres of the 8% solution, how many litres of the 2% solution will have to be added?

Section- D **4 x 6 =24**

33) A survey of 500 television viewers produced following information, 285 watch Football, 195 watch Hockey, 115 watch Basketball, 45 watch both Football and Basketball and 70 watch Football and Hockey, 50 watch Hockey and Basketball and 50 do not watch any of the three games. How many watch all the three games? How many watch exactly one of the three games?

34) Solve the following system of inequalities graphically:

$x + y \geq 1, x + 9y \leq 63, x \leq 6, y \leq 5, x \geq 0, y \geq 0$

35) Prove that $cos^2 x + cos^2\left(x + \frac{\pi}{3}\right) + cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$

Hence prove that $sin^2 x + sin^2\left(x + \frac{\pi}{3}\right) + sin^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$

OR

If $anx = \frac{3}{4}$, x in quadrant III , find the value of $sin\frac{x}{2}$, $cos\frac{x}{2}$ and $tan\frac{x}{2}$

36) Derive cos (x+y), hence find cos2x.

OR

Using principle of Mathematical induction, prove that

$$\left(1 + \frac{3}{1}\right)\left(1 + \frac{5}{4}\right)\left(1 + \frac{7}{9}\right) \ldots \left(1 + \frac{2n+1}{n^2}\right) = (n+1)^2$$

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