No. of printed pages: 3 + 1graph

INDIAN SCHOOL SOHAR

FIRST TERM EXAMINATION (2018-19)

MATHEMATICS

STD: XI **MAX. MARKS: 100**

DATE: 18 .09.18 **DURATION: 3Hrs**

General Instructions:

(i) **All** questions are compulsory.

(ii) This question paper contains **29** questions.

(iii) Question **1- 4** in **Section A** are very short-answer type questions carrying **1** mark each.

(iv) Question **5-12** in **Section B** are short-answer type questions carrying **2** marks each.

(v) Question **13-23** in **Section C** are long-answer-**I** type questions carrying **4** marks each.

(vi) Question **24-29** in **Section D** are long-answer-**II** type questions carrying **6** marks each.

SECTION – A

Questions 1 to 4 carry 1 mark each

1. Write the contrapositive of the statement "If a number is divisible by 9, then it is divisible by 3 ".
2. Find the value of $\left(-\sqrt{-1}\right)^{4n-3}$, where n ∈ N.
3. For the following statement, determine whether an inclusive "OR" or exclusive "OR" is used. Give reason for your answer: "All integers are positive or negative".
4. Evaluate : $\sin 50^0 - \sin 70^0 + \sin 10^0$

SECTION – B

Questions 5 to 12 carry 2 marks each.

5. A = {x: x ,is a prime number ,x ≤ 6},
   i) If n represents any member of A, then, write the set E containing all numbers represented by n + 1 in roster form.
   ii) Write the power set of A.
6. Given R= {(x,y): x, y ∈ N, $x^2 + y^2 = 25$} , find domain and range of R. Also state whether R is a function if x,y ∈ Z? Justify your answer
7. Find the radius of a circle in which central angle of 60^0 intercepts an arc of length 37.4 cm.
8. Find the value of x, if $\left(\frac{1+i}{1-i}\right)^x = 1$
9. In how many ways 3 mathematics books, 4 history books, 3 chemistry books and 2 biology books can be arranged on a shelf so that all books of the same subjects are together.

10. Find the principal solution of the equation tan x = $\frac{-1}{\sqrt{3}}$

11. Prove the following statement by contradiction method

    P: The sum of an irrational number and rational number is irrational.

12. Find the domain of the function f given by f (x) = $\frac{1}{\sqrt{[x]^2-[x]-6}}$

SECTION – C

Questions 13 to 23 carry 4 marks each.

13. For all sets A, B and C, Is (A – B) ∩ (C – B) = (A ∩ C) – B? Justify your answer using properties of sets.

14. Find the domain and range of the function f (x) == $\frac{x^2}{4+x^2}$

15. Prove that : $\frac{sec8\theta-1}{sec4\theta-1} = \frac{tan8\theta}{tan2\theta}$

16. Prove the following: $\tan 4x = \frac{4\tan x(1-\tan^2 x)}{1-6\tan^2 x+\tan^4 x}$

17. Prove the following by using the principle of mathematical induction for all $n \epsilon N$:

    $1.3 + 2.\ 3^2 + 3.3^3 + \ldots + n\ .3^n = \frac{(2n-1)3^{n+1}+3}{4}$

    OR

    $1 + 2 + 3 + \ldots\ldots + n < \frac{1}{8}(2n+1)^2$

18. Find the square root of the following: - 8- 6i

    OR

    Convert the complex number z = - 1 + $\sqrt{-3}$ in the polar form

19. Prove that : ${}^{n}C_{r} + {}^{n}c_{r-1} = {}^{n+1}C_{r}$

20. Find the 4th term from the end in the expansion of $\left(\frac{x^3}{2} - \frac{2}{x^2}\right)^9$.

21. Eighteen guests are to be seated, half on each side of a long table. Four particular guests desire to sit on one particular side and three others on other side of the table. Find the number of ways the seating arrangements can be made.

    OR

    Given 5 different green dyes, 4 different blue dyes and 3 different red dyes. Find the number of combinations of dyes which can be chosen taking atleast one green and one red dye.

22. Show that $9^{n+1} - 8n - 9$ is divisible by 64, whenever n is a positive integer by using Binomial theorem.

23. Solve $1 \leq |x-2| \leq 3$.

SECTION – D

Questions 24 to 29 carry 6 marks each.

24. Out of 100 students; 15 passed in English, 12 passed in Mathematics, 8 in Science, 6 in English and Mathematics, 7 in Mathematics and Science; 4 in English and Science; 4 in all the three. Find how many passed (i) in English and Mathematics but not in Science (ii) in Mathematics and Science but not in English (iii) in Mathematics only (iv) in more than one subject only.

25. Show that : $2 \sin^2 \beta + 4 \cos (\alpha + \beta) \sin \alpha \sin \beta + \cos 2 (\alpha + \beta) = \cos 2\alpha$

OR

Prove that: $cos\frac{2\pi}{7} + cos\frac{4\pi}{7} + cos\frac{6\pi}{7} = \frac{-1}{2}$

26. The letters of the word 'INDIA' are written in all possible orders and these words are written out as in a dictionary. Find the rank of the word 'INDIA'. What is the 25^{th} word?

27. Solve the following system of inequalities graphically:

$x - 2y \leq -1,\ 2x + y \geq 3\ ,\ y < 3\ ,\ \ x, y \geq 0$

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

$$\sin \theta + \sin 2\theta + \sin 3\theta + ... + \sin n\theta = \frac{\sin\frac{n\theta}{2} \sin\left(\frac{n+1}{2}\right)\theta}{sin\frac{\theta}{2}}$$

29. The second, third and fourth terms in the binomial expansion $(x + a)^n$ are 240, 720 and 1080, respectively. Find *x*, *a* and *n*.

OR

Prove that the coefficient of x^n in $(1+x)^{2n}$ is twice the coefficient of x^n in $(1 + x)^{2n-1}$.

**** THE END ****