INDIAN SCHOOL SOHAR

FINAL EXAMINATION (2019-20)

MATHEMATICS

STD: XI   MAX. MARKS: 80

DATE: .02.2020   DURATION: 3Hrs

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General Instructions:

1. All questions are compulsory.
2. The question paper consists of 36 questions divided into four sections A, B,C and D. Section A comprises of 20 questions of one mark each, section B comprises of 6 questions of two marks each, section C comprises of 6 questions of four marks each and section D comprises of 4 questions of six marks each
3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
4. There is no overall choice. However, an internal choice has been provided. You have to attempt only one of the alternatives in all such questions.
5. Use of calculators is not permitted.

SECTION – A

Questions 1 to 20 carry 1 mark each.
(Q.1 to Q.10) are multiple choice type questions. Select the correct option.

1. For all sets A and B, (A − B)$\cup B$ is equal to
   a) $(A \cap B')$ b) $A \cup B$ c) $(A \cap B)$ d) $A' \cup B$

2. The domain and range of the function f given by f(x) = 4 - $|x + 3|$
   a) R^+ , $(-\infty, 3]$ b) R , $(-\infty, 4]$ c) R^+ , $(-\infty, 4)$ d) R , $(-\infty, 4)$

3. The least and greatest value of sinx cosx are
   a) -1,1   b) $\frac{-1}{4}, \frac{1}{4}$ c) $\frac{-1}{2}, \frac{1}{2}$ d) -2,2

4. The complex number z which satisfies the condition $\left|\frac{i+z}{i-z}\right| = 1$ lies on
   a) Circle $x^2+y^2=1$ b)the x-axis   c) the y - axis   d) the line x + y =1

5. The number of different signals that can be generated by arranging at least 2 flags in order (one below the other) on a vertical staff, if five different flags are available
   a) 20   b) 120   c) 60   d) 320

6. How many different 4-letter words can be formed with the letters of the word 'JAIPUR' when A and I are always to be included?
   a) 144   b) 24   c) 6   d) 12

7. If the sum of the infinite G.P. is $\frac{4}{3}$ and its first term is $\frac{3}{4}$ then its common ratio is
   a) $\frac{7}{16}$ b) $\frac{9}{16}$ c) $\frac{1}{9}$ d) $\frac{7}{9}$

8. A person has 2 parents, 4 grandparents, 8 great grandparents, and so on. Find the number of his ancestors during the ten generations preceding his own.

a) 2047   b) 2046   c) 1023   d) 1024

9. Three numbers are choosen from 1 to 20, then the probability that they are consecutive

a) $\frac{3}{190}$ b) $\frac{187}{190}$ c) $\frac{18}{20}$ d) $\frac{6}{20}$

10. If A and B are mutually exclusive events, P (A) = 0.35 and P (B) = 0.45 then P(A'∩B') is
    a) 0.80   b) .10   c) .20   d)0

(Q.11 to Q.15) Fill in the blanks

11. If A is the set of even natural numbers less than 8 and B is the set of prime numbers less than 7, then the number of relation from A to B is _____

12. If α and β be between 0 and $\frac{\pi}{2}$ and if $\cos(\alpha + \beta) = \frac{12}{13}$ and $\sin(\alpha - \beta) = \frac{3}{5}$, then the value of $\sin 2\alpha$ is _____

13. There are 5 professors and 6 lecturers out of whom a committee of 2 professors and 3 lecturers is to be formed. The number of ways a particular lecturer is included is _____

14. If $^5P_r = 2.\ ^6P_{r-1}$, then r =_____

15. In an A.P. if m^{th} term is n and the nth term is m, where m ≠ n, then the pth term is _____

(Q. 16 to Q.20) Answer the following Question

16. Solve $\sqrt{5}\ x^2 + x + \sqrt{5} = 0$

17. Find the 5th term from the end in the expansion of $\left(3x - \frac{1}{x^2}\right)^{10}$

OR

Find the middle term in the expansion of $\left(\frac{2x^2}{3} - \frac{3}{2x}\right)^{20}$

18. For the following statement, determine whether an inclusive 'OR' or exclusive 'OR' is used. Give reason for your answer: "Two lines intersect at a point or are parallel".

19. Write the negation of the following statement: "For every real number x, x is less than x+1".

20. Evaluate: $\lim\limits_{x \to 0} \frac{1-\cos 2mx}{1-\cos 2nx}$

OR

Evaluate: $\lim\limits_{x \to 0} \frac{(e^{3x}-1)(\sin x+5)}{(e^{5x}-1)}$

SECTION – B

Questions 21 to 26 carry 2 marks each.

21. Find the domain and the range of the real function f defined by $f(x) = \frac{2x^2}{x^2+1}$

22. Find the equation of the set of the points P such that its distances from the points A (3, 4, –5) and B (– 2, 1, 4) are equal.

23. Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ into polar form.

OR

If α and β are different complex numbers with $|β| = 1$, then find $\left|\frac{β-α}{1-\bar{α}β}\right|$

24. If f(x) = $\begin{cases} x+2 , x \leq -1 \\ cx^2, x > -1 \end{cases}$ then find c when $\lim\limits_{x \to -1} f(x)$ exists.

25. The alphabets of word ALLAHABAD are arranged at random. Find the probability that in the words so formed, all identical alphabets are found together.

OR

If 12 identical balls are to be placed in 3 different boxes, then find the probability that one of the particular boxes contain exactly 3 balls .

26. Differentiate the following using the first principle: tan x

SECTION – C

Questions 27 to 32 carry 4 marks each.

27. Let S be the sum, P the product and R the sum of reciprocals of n terms in a G.P. Prove that $P^2 R^n = S^n$

28. Find the coordinate of the foci, the vertices, the length of major axis , the minor axis , the eccentricity and the length of latus rectum of the conic: $16x^2+y^2=16$

29. Find the general solution for the following equation: $\tan x + \tan 2x + \sqrt{3} \tan x \tan 2x = \sqrt{3}$

30. Find the coordinates of the foot of perpendicular from the point (−1, 3) to the line $3x – 4y – 16 = 0$. Also find the image of the point (-1,3) with respect to the line, assuming the line to be a plane mirror.

OR

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

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

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

OR

$4^n + 15n -1$ is divisible by 9 for all natural numbers n

32. Solve the following system of inequalities graphically:

$2x + 3y \leq 60, \; x \geq 2, \; y \geq 2x, \; x \geq 0, \; y \geq 0$

Questions 33 to 36 carry 6 marks each.

33. In a class of 55 students, the number of students studying different subjects are 23 in Mathematics, 24 in Physics, 19 in Chemistry,12 in Mathematics and Physics,9 in Mathematics and Chemistry, 7 in Physics and chemistry and 4 in all the three subjects. Find the number of students i) studying exactly one subject ii) studying physics and Chemistry but not Mathematics ii) none of the given subject

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

    OR

    If α and β are the solutions of the equation a tan θ + b sec θ = c, then show that

    tan (α + β) = $\frac{2ac}{a^2-c^2}$

35. If the coefficient of a^{r-1}, a^{r} and a^{r+1} in the expansion of $(1+ a)^n$ are in arithmetic progression, prove that $n^2 – n(4r+1) + 4r^2 – 2 = 0$.

    OR

    In the binomial expansion of $(1 + x)^n$, the coefficient of the fifth, sixth and seventh terms are in A.P. Find all values of n for which this can happen.

36. Calculate mean, standard deviation and variance for the following distribution.

Classes	5– 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35
Frequency	2	9	29	54	11	5

**** THE END ****