Roll number -

APEEJAY SCHOOL PITAMPURA

FIRST TERM EXAMINATION 2016-17

CLASS-XI

Time - 3hrs **MATHEMATICS** **M.M-90**

General Instructions:

I All questions are compulsory.

II The question paper consists of 26 questions divided into three sections A, B and C.

Section A comprises of 8 questions of 1 mark each.

Section B comprises of 13 questions of 4 marks each.

Section C comprises of 5 questions of 6 marks each.

III. Use of calculator is not permitted.

SECTION - A

Q1. Write the following set in the roaster form:
$\{x : x^2 + 7x - 8 = 0, x \in R\}$

Q2. What is the polar form of the complex number $(i^{25})^3$?

Q3. Solve the inequality for real x.

$$\frac{x-2}{x+5} > 2.$$

Q4. All the letters of the word EAMCOT are arranged in different possible ways. Find the number of ways in which no two vowels are adjacent to each other.

Q5. If 5 sin x = 3 , find the value of $\frac{\sec x - \tan x}{\sec x + \tan x}$.

Q6. At the end of each year the value of a certain machine has depreciated by 20% of its value at the beginning of that year. If its initial value was Rs.1250, find the value at the end of 5 years.

Q7. Taking the moon's distance from the earth as 360000 km and the angle subtended by the moon at any point O on the earth as half a degree ,estimate the diameter of the moon.(use π =3.1416)

Q8. If a is the A.M between b and c , and b is the G.M between a and c , then show that $\frac{1}{a}, \frac{1}{c}, \frac{1}{b}$ are in A.P.

SECTION-B

Q9 Use the properties of sets to prove that for any sets A, B and C

1) $A-(A\cap B)=A-B$ 2) $(A-B)\cap(A-C)=A-(B\cup C)$

Q10 Solve the following equation:

$$\tan\left(x+\frac{\pi}{12}\right)=3\tan\left(x-\frac{\pi}{12}\right)$$

Q11. Prove that $\sin\frac{\pi}{18}+\sin\frac{\pi}{9}+\sin\frac{2\pi}{9}+\sin\frac{5\pi}{18}=\sin\frac{7\pi}{18}+\sin\frac{4\pi}{9}$.

Q12. Two finite sets have m and n elements respectively. The total number of subsets of first set is 56 more than the total number of subsets of the second set. Find the values of m and n.

Q13. If α and β are different complex numbers with $|\beta|=1, then find \left|\frac{\beta-\alpha}{1-\bar{\alpha}\beta}\right|$.

Q14. Show that ($x^2 + xy + y^2$),($z^2 + xz + x^2$) and ($y^2 + yz + z^2$)are consecutive terms of an A.P. if x ,y and z are in A.P.

Q15. By principle of mathematical induction, prove that $\forall n \in N$
$(1+x)^n \geq 1+nx$, x > -1

Q16. Solve the following system of linear inequalities graphically:

$2x + y \leq 24$, $x + y < 11$, $2x + 5y \leq 40$, $x > 0$, $y \geq 0$.

Q17. How many odd numbers less than 1000 can be formed using the digits 0 , 1, 4, 5, 7, 8 if the repetition of digits is allowed.

Q18. A boy has 3 library tickets and 8 books of his interest in the library. Of these 8 books, he does not want to borrow Mathematics Part II unless Mathematics part I is also borrowed. In how many ways can he choose the three books to be borrowed? .

Q19. If S be the sum , P the product and R the sum of reciprocals of n terms of a G.P., Prove that $P^2 R^n = S^n$.

Q20. If $\frac{2}{3} = \left(x - \frac{1}{y}\right) + \left(x^2 - \frac{1}{y^2}\right) + \left(x^3 - \frac{1}{y^3}\right) + ...upto\infty$ and xy = 2 and $|x| < 1$, calculate the values of x and y.

Q21. Solve the equation : $2|z|^2 + z^2 - 5 + i\sqrt{3} = 0.$

SECTION-C

Q22. In an University ,out of 100 students 15 offered Mathematics only;12 offered Statistics only;8 offered only Physics; 40 offered Physics and Mathematics ;20 offered Physics and Statistics ;10 offered Mathematics and Statistics ;65 offered Physics. By drawing a Venn diagram, find the number of students who

i)offered Mathematics

ii)offered Statistics

iii)did not offer any of the above three subjects.

Q23. Find the value of : $\cos\frac{\pi}{5}\cos\frac{2\pi}{5}\cos\frac{4\pi}{5}\cos\frac{8\pi}{5}$.

Q24. Using induction, prove that for all n $\in$ N .

$5^n - 5$ is divisible by 4. Hence prove that $2.7^n + 3.5^n - 5$ is divisible by 24 for all n .

Q25. If all the letters of the word "MOTHER" are written in all possible orders and the words so formed are arranged in a dictionary order, then find the rank of the word MOTHER.

Q26. Find the sum of first n terms the series

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + ...$$