ST. XAVIER'S SENIOR SECONDARY SCHOOL, DELHI - 110054

Class – 11 Time : 3hrs.

Mock Test – 2 Half Yearly Examination in **MATHEMATICS** M. Marks : 100

GENERAL INSTRUCTIONS :-

1. All questions are compulsory.
2. SECTION – A comprises of 6 questions of one marks each.
3. SECTION – B comprises of 13 questions of four marks each.
4. SECTION – C comprises of 7 questions of six marks each.

SECTION – A

Q. 1. Find the general solution of the equation $\cos 4x = \cos 2x$

Q. 2. If the arcs of the same lengths in two circles subtend angles 65°and 110° at the centre, find the ratio of their radii.

Q. 3. If $\sin x = -\frac{3}{5}$, $\cos y = -\frac{12}{13}$, x and y both lies in 2^{nd} quadrant find the value of $\sin(x + y)$

Q. 4. Find the complex number 'z' so that $|z| + 2i = 2z$

Q. 5. Evaluate : $(\sqrt{2} + 1) + 1 + (\sqrt{2} - 1) + - - - \infty$

Q. 6. Find the value of 'r' if $P(n, r) = C(n, r)$

SECTION – B

Q. 7. Prove that : $\sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + 2\cos 16\theta}}}} = 2\cos\theta$

Q. 8. Prove that : $3(\sin x - \cos x)^4 + 4(\sin^6 x + \cos^6 x) + 6(\sin x + \cos x)^2 = 13$

Q. 9. Solve the inequation : $\frac{x-1}{2x+1} < \frac{x-3}{2x-3}$; $x \in R$

Q. 10. Using Principle of Mathematical Induction prove that,
for all $n \geq 1$, $1^3 + 3^3 + 5^3 + - - - + (2n-1)^3 = n^2(2n^2 - 1)$

Q. 11. If 'α' and 'β' are two different complex numbers with $|\beta| = 1$, then find $\left|\frac{\beta - \alpha}{1 - \bar{\alpha}\beta}\right|$

Q. 12. Find the real numbers x & y if $(x - iy)(3 + 5i)$ is the conjugate of $-6 - 24i$.

Q. 13. Evaluate : $\sqrt{8 - 15i}$

Q. 14. How many natural number not exceeding 4321 can be formed with the digits 1, 2, 3, and 4, if the digits can repeat**?**

Q. 15. What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these (*i*) four cards are of the same suit, (*ii*) four cards belong to four different suits.

Q. 16. Find the number of words with or without meaning which can be made using all the letters of the word *DELHI*. If these words are written as in a dictionary**,** what will be the 100^{th} word**?**

P.T.O

Q. 17. The sum of two numbers is 6 times their geometric means, show that numbers are in the ratio $3 + 2\sqrt{2} : 3 - 2\sqrt{2}$

Q. 18. Find four numbers forming a geometric progression in which the third term is greater than the first term by 9, and the second term is greater than the 4^{th} by 18.

Q. 19. Sum the series to infinity $x(x + y) + x^2(x^2 + y^2) + x^3(x^3 + y^3) + - - - \infty$, with $|x| < 1$ and $|y| < 1$

SECTION – C

Q. 20. Solve for x : $\tan\left(x + \frac{\pi}{12}\right) = 3\tan\left(x - \frac{\pi}{12}\right)$

Q. 21. Prove that $\cot x - \tan x = 2\cot 2x$. Hence prove that, $\tan x + 2\tan 2x + 4\tan 4x + 8\cot 8x = \cot x$.

Q. 22. Show that **(*i*)** $\tan 4x = \frac{4\tan x\,(1 - \tan^2 x)}{1 - 6\tan^2 x + \tan^4 x}$

(*ii*) $\cot x \,.\, \cot 2x - \cot 2x \,.\, \cot 3x - \cot 3x \,.\, \cot x = 1$

Q. 23. Using Principle of Mathematical Induction prove that :

for all $n \geq 1, 1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + - - - + n\ terms = \frac{n\,(n+1)^2(n+2)}{12}$

Q. 24. If S_1, S_2, S_3 are the sum of first n natural numbers, their squares and their cubes, respectively, then show that, $9{S_2}^2 = S_3(1 + 8S_1)$

Q. 25. Find the sum of the first n terms of the series: $3 + 7 + 13 + 21 + 31 + \ldots$.

Q. 26. Solve the system of inequalities graphically **:**

$2x + 3y \geq 6, x - 2y \leq 2, 3x + 2y < 12, 2y - 3x \leq 3, x \geq 0, y \geq 0$

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