

# TEST PAPER – 2 ( Green Ways Modern)

## Mathematics – XI

Time : 3 hr

Max 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.
5. Internal choice has been provided in 04 questions of four marks each and 02 questions of six marks each. You have to attempt only one of the alternatives in all such questions.

### SECTION – A

- Q. 1. Let  $f$  and  $g$  be two functions given by  $f = \{(2, 4), (5, 6), (8, -1), (10, -3)\}$   
 $g = \{(2, 5), (7, 1), (8, 4), (10, 13), (11, -5)\}$  then find the range of  $f \circ g$
- Q. 2. Find the term free from  $x$  in the expansion  $\left\{ \frac{3x^2}{2} - \frac{1}{3x} \right\}^9$
- Q. 3. If length of perpendicular from origin on a line is 2 unit and the perpendicular is making an angle  $135^\circ$  with  $x$  – axis. Find equation of the line.
- Q. 4. Find the contrapositive of the statement “If a triangle is equilateral, it is isosceles”.
- Q. 5. Check whether the statement “If  $x, y \in \mathbb{Z}$  are such that  $x$  and  $y$  are odd, then  $xy$  is odd” is true or not.
- Q. 6. Using the words “necessary and sufficient” rewrite the statement  
“The integer  $n$  is odd if and only if  $n^2$  is odd”.

### SECTION – B

- Q. 7. There are 200 individuals with a skin disorder, 120 had been exposed to the chemical  $C_1$ , 50 to chemical  $C_2$ , and 30 to both the chemicals  $C_1$  and  $C_2$ . Find the number of individuals exposed to  
(i) Chemical  $C_2$  but not chemical  $C_1$                       (ii) Neither Chemical  $C_1$  nor chemical  $C_2$ .
- Q. 8. For three sets A, B and C prove that  
 $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

- Q. 9. Prove that :  $\sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + 2 \cos 16\theta}}}} = 2 \cos \theta$

OR

If in a triangle ABC,  $\frac{1}{a+c} + \frac{1}{b+c} = \frac{3}{a+b+c}$  then prove that  $\angle C = 60^\circ$

- Q. 10. Using Principle of Mathematical Induction prove that for all  $n \geq 1$ ,  $1^2 + 2^2 + 3^2 + \dots + n^2 > \frac{n^3}{3}$
- Q. 11. Let a relation R be defined on set of naturals N such that  $R = \{(x, y) : x + 2y = 41; x, y \in \mathbb{N}\}$ .  
What is the domain, co-domain and range of R? Is this relation a function?
- Q. 12. 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?
- Q. 13. Evaluate :  $\sqrt{-7 - 24i}$
- Q. 14. If the coefficients of  $a^{r-1}$ ,  $a^r$  and  $a^{r+1}$  in the expansion of  $(1+a)^n$  are in A.P, prove that  $n^2 - n(4r+1) + 4r^2 - 2 = 0$ .
- Q. 15. Find the sum to  $n$  terms of the series :  $5 + 11 + 19 + 29 + 41 - \dots$

OR

If the ratio of the A.M. and G.M. of two positive numbers  $a$  and  $b$ , is  $m : n$ . Then show that  
 $a : b = m + \sqrt{m^2 - n^2} : m - \sqrt{m^2 - n^2}$

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- Q. 16. A point R with  $x$  - coordinate 4 lies on the line segment joining the points P(2, -3, 4) and Q (8, 0, 10). Find the coordinates of the point R.
- Q. 17. Find the equation of the ellipse, such that major axis is  $x$  - axis, centre is at origin and the ellipse passes through (4, 3) and (6, 2).

OR

Find the vertex, focus, LLR and directrix of the parabola  $4x^2 + 12x - 20y + 67 = 0$

- Q. 18. A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of (i) at least 3 girls ? (ii) at most 3 girls ?
- Q. 19. 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.

OR

Find the distance of the point (1, 2) from the line  $4x + 7y + 5 = 0$  measured along the line  $2x - y = 3$ .

SECTION - C

Q. 20. Prove that :  $\tan \frac{\pi}{24} = \sqrt{6} - \sqrt{3} - \sqrt{4} + \sqrt{2}$

OR

Prove that :  $\cos \left(\frac{\pi}{5}\right) \cdot \cos \left(\frac{2\pi}{5}\right) \cdot \cos \left(\frac{4\pi}{5}\right) \cdot \cos \left(\frac{8\pi}{5}\right) = -\frac{1}{16}$

Q. 21. (i) Show that :  $\frac{\sec 8x - 1}{\sec 4x - 1} = \frac{\tan 8x}{\tan 2x}$

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

- Q. 22. If the different permutations of all the letter of the word *EXAMINATION* are listed as in a dictionary,  
(i) How many words are there in this list before the first word starting with E?  
(ii) How many words are there in this list starting with a vowel?

- Q. 23. If A, B and C can solve a problem with respective probabilities  $\frac{1}{2}$ ,  $\frac{1}{3}$  and  $\frac{1}{6}$ . Find the probabilities of  
(i) Problem is solved (ii) Exactly one of them solves (iii) Exactly three of them solves

- Q. 24. If  $a, b$  are the roots of  $x^2 - 3x + p = 0$  and  $c, d$  are roots of  $x^2 - 12x + q = 0$ , where  $a, b, c, d$  form a G.P. Prove that  $(q + p) : (q - p) = 17 : 15$ .

- Q. 25. Calculate Standard Deviation, using short-cut method for the following distribution:

Classes	0 - 30	30 - 60	60 - 90	90 - 120	120 - 150	150 - 180	180 - 210
Frequency	2	3	5	10	3	5	2

- Q. 26. Find the differential coefficient of  $\sqrt[3]{\tan x}$ , by first principle.

OR

Find the value of 'a' and 'b', so that  $\lim_{x \rightarrow 1} f(x) = f(1)$ , for the function

$$f(x) = \begin{cases} 5ax - 2b & ; x < 1 \\ 11 & ; x = 1 \\ 3ax + b & ; x > 1 \end{cases}$$

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