

TEST PAPER – 2
Green Fields Pb. School Special
Mathematics – XI

Time : 3 hr

Max Marks : 100

General Instructions :

1. All questions are compulsory.
2. The question paper consists of **29 questions** divided into three sections **A, B** and **C**. **Section A** comprises of **10 questions of one mark** each, **Section B** comprises of **12 questions of four marks** each and **Section C** comprises of **07 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, 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.
5. Use of calculators is not permitted. You may ask for logarithmic tables, if required.

SECTION – A

- Q. 1. Evaluate: $\tan\left(\frac{13\pi}{12}\right)$
- Q. 2. Solve for natural $x : \frac{x-3}{5-x} \geq \frac{5}{12}$
- Q. 3. Find the equation of ellipse having ends of major axis $(0, \pm 3)$ and ends of minor axis $(\pm 2, 0)$.
- Q. 4. If the lines $2x + y - 3 = 0$, $5x + ky - 3 = 0$ and $3x - y - 2 = 0$ are concurrent, find the value of k .
- Q. 5. Write the statement $t : It is necessary to have a password to log on to the server.$
In the form “if p , then q ”
- Q. 6. If $z_1 = 2 - i$, $z_2 = 1 + i$, find $\left| \frac{z_1 + z_2 + 1}{z_1 - z_2 + i} \right|$
- Q. 7. Find r , if ${}^5P(4, r) = {}^6P(5, r - 1)$
- Q. 8. A coin is tossed. If the outcome is a head, a die is thrown. If the die shows up an even number, the die is thrown again. Find the probability that the coin turns up in tail?
- Q. 9. Find the term from the free from ‘ x ’ in $\left\{ \frac{3}{x} - \frac{x^3}{6} \right\}^7$
- Q. 10. The centroid of a triangle **ABC** is at the point **(1, 1, 1)**. If the coordinates of **A** and **B** are **(3, -5, 7)** and **(-1, 7, -6)** respectively. Find the coordinates of the point **C**.

P.T.O

SECTION – B

- Q. 11.** 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_1 but not chemical C_2 (ii) No Chemical.

OR

If $A - B = \phi$ then prove the following : (i) $A \subset B$ (ii) $A \cap B = A$ (iii) $A \cup B = B$

- Q. 12.** $A = \{1, 2, 3, 5\}$ and $B = \{4, 6, 9\}$. Let a relation $R : A \rightarrow B$, as $\{(x, y) : |x - y| \text{ is odd ; } x \in A, y \in B\}$.
(i) Write R in roster form. (ii) Find the domain of R (iii) Find the range of R .

Q. 13. Prove that : $\cos\left(\frac{\pi}{5}\right) \cdot \cos\left(\frac{2\pi}{5}\right) \cdot \cos\left(\frac{4\pi}{5}\right) \cdot \cos\left(\frac{8\pi}{5}\right) = -\frac{1}{16}$

OR

Show that , $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$

- Q. 14.** If S_1, S_2, S_3 are the sum of first n natural numbers, their squares and their cubes, respectively.
Show that $9S_2^2 = S_3(1 + 8S_1)$.

- Q. 15.** Reduce $\left\{ \frac{1}{1-4i} - \frac{2}{1+i} \right\} \left\{ \frac{3-4i}{5+i} \right\}$ to the standard form $x + iy$

Q. 16. Evaluate : $\lim_{x \rightarrow 0} \left\{ \frac{(a+x)^2 \sin(a+x) - a^2 \sin a}{x} \right\}$

- Q. 17.** Three letters are dictated to three persons and an envelope is addressed to each of them, the letters are inserted into the envelopes at random so that each envelope contains exactly one letter. Find the probability that at least one letter is in its proper envelope.

- Q. 18.** A manufacturer has **600** litres of a **12%** solution of acid. How many litres of a **30%** acid solution must be added to it so that acid content in the resulting mixture will be more than **15%** but less than **18%**?

OR

Solve the inequation: $|2x - 3| < |x + 5|$; $x \in \mathbb{R}$

- Q. 19.** Find the coordinates of the points which trisect the line segment joining the points $P(4, 2, -6)$ and $Q(10, -16, 6)$.

- Q. 20.** Find the number of four letters arrangements of the letters of the word **INDEPENDENCE**.

- Q. 21.** Show that the statement p : "**If x is a real number such that $x^3 + 4x = 0$, then $x = 0$** " is true by
(i) direct method, (ii) method of contradiction, (iii) method of contrapositive.

- Q. 22.** The sum of the coefficients of the first three terms in the expansion of $\left\{ x - \frac{3}{x^2} \right\}^n$, $n \in \mathbb{N}$, is **559**.
Find the term of the expansion containing x^3 .

OR

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

SECTION – C

Q. 23. In a triangle **ABC** prove that : $\frac{b^2 - c^2}{a^2} \sin 2A + \frac{c^2 - a^2}{b^2} \sin 2B + \frac{a^2 - b^2}{c^2} \sin 2C = 0$

OR

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

Q. 24. Using first principle, find the derivative of the function $f(x) = \operatorname{cosec}(5x + 3)$

Q. 25. Using principle of mathematical induction prove that,

for all $n \geq 1$, $\sin x + \sin 2x + \sin 3x + \dots + \sin nx = \sin\left(\frac{nx}{2}\right) \cdot \operatorname{cosec}\left(\frac{x}{2}\right) \cdot \sin\left(\frac{(n+1)x}{2}\right)$

Q. 26. Find the direction in which a line must be drawn through the point $(-1, 2)$ so that its point of intersection with the line $x + y = 4$ may be at a distance **3** units from this point

OR

If the line $\frac{x}{a} + \frac{y}{b} = 1$ moves in such a way that $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}$ where c is a constant. Then prove that the locus of the foot of the perpendicular from the origin on the given line is $x^2 + y^2 = c^2$

Q. 27. The cable of uniform loaded suspension bridge hangs in the form of a parabola. The roadway is horizontal and **100 m** long is supported by vertical wire attached to the cable, the longest wire being **30m** and the shortest wire being **6 m**. Find the length of the wire attached to the roadway **18 m** from the middle.

Q. 28. Find the sum to n terms of the series : **5 + 11 + 19 + 29 + 41 - - -**.

Q. 29. The following is the record of goals scored by team A in a football session:

No. of goals	0	1	2	3	4
No. of matches	1	9	7	5	3

For the team **B**, mean number of goals scored per match was **2** with standard deviation **1.25** goals. Find which team may be considered more consistent?
