TEST PAPER – 1
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. In a triangle **ABC,** if the angles are in the ratio **1 : 2 : 3,** Find in the ratio of the corresponding sides.

Q. 2. The marks obtained by a student of Class **XI** in first and second terminal examination are **62** and **48,** respectively**.** Find the number of minimum marks he should get in the annual examination to have an average of at least **60** marks.

Q. 3. Find the equation of the parabola with vertex **(0, 0)** passing through **(2, 3)** and symmetric with respect to ***x* – axis**.

Q. 4. Find the equation of the set of points which are equidistant from the points **(1, 2, 3)** and **(3, 2, –1).**

Q. 5. In the statement ***p : To enter a country, you need a passport or a voter registration card.*** Determine whether an inclusive **"**Or**"** or exclusive **"**Or**"** is used. Give reasons for your answer.

Q. 6. Find the value of the complex number $i^{2014} + i^{2013} + i^{2012} + i^{2011}$.

Q. 7. If a polygon has **27** diagonals, find the number of sides it can has**.**

Q. 8. If **A** and **B** are events such that **P(A) = 0.42, P(B) = 0.48** and **P(A ∪ B) = 0.74.** Determine **P(A** but not **B).**

Q. 9. Find the 4^{th} term from the end in $\left\{\frac{3}{x^2} - \frac{x^3}{6}\right\}^7$

Q. 10. Find the equation of the right bisector of the line segment joining the points **(3, 4)** and **(–1, 2).**

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 = φ** then prove the following **: (*i*) A ⊂ B (*ii*) A ∩ B = A (*iii*) A ∪ B = B**

Q. 12. Let **R** be a relation on **Z** defined by **R = {(*x*, *y*) : | *x* – *y* |** is divisible by **3 ; *x*, *y* ∈ Z }.**
Are the following true?
(*i*) (*x*, *x*) ∈ R, for all *x*∈**N** **(*ii*) (*x*, *y*) ∈ R, ⇒ (*y*, *x*) ∈ R** **(*iii*) (*x*, *y*) ∈ R, (*y*, *z*) ∈ R ⇒ (*x*, *z*) ∈ R.**

Q. 13. Prove that **:** $\sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{2 + 2\cos 16\theta}}}} = 2\cos\theta$

OR

Show that : $\tan 4x = \dfrac{4\tan x\,(1 - \tan^2 x)}{1 - 6\tan^2 x + \tan^4 x}$

Q. 14. If f is a function satisfying $f(x + y) = f(x), f(y)\ \forall\ x, y \in \mathbf{N}$ such that $f(1) = 3$ and $\sum_{x=1}^{n} f(x) = 120$, find the value of n.

Q. 15. Find real **θ** such that, $\dfrac{3 + 2i\sin\theta}{1 - 2i\sin\theta}$ is purely imaginary.

Q. 16. If, $f(x) = \begin{cases} a + bx & , x < 1 \\ 4 & , x = 1 \\ b - ax & , x > 1 \end{cases}$, For what value(s) of a and b does $\lim_{x \to 1} f(x) = f(1)$?

Q. 17. If **4**-digit numbers greater than **5,000** are randomly formed from the digits **0, 1, 3, 5,** and **7,** what is the probability of forming a number divisible by **5** when, the digits can be repeated **?**

OR

If **'A' , 'B'** and **'C'** are any three events associated with any random experiment, then prove that, **P(A∪B∪C) = P(A) + P(B) + P(C) – P(A∩B) – P(B∩C) – P(C∩A) + P(A∩B∩C).**

Q. 18. Solve the system of inequalities graphically**:** $x + 2y \leq 10$, $x + y \geq 1$, $x - y < 0$, $x \geq 0$, $y \geq 0$

Q. 19. A point **R** with *y* – 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. 20. In how many ways can the letters of the word **PERMUTATIONS** be arranged if the
(*i*) All vowels are not together **(*ii*)** there are always **3** letters between **P** and **S?**

Q. 21. Using method of contradiction, show that $\sqrt{5}$ is an irrational number.

Q. 22. The coefficients of three consecutive terms in the expansion of $(1 + a)^n$ are in the ratio**1: 7 : 42.** Find n.

OR

Show that the middle term in the expansion of $(1 + x)^{2n}$ is $\dfrac{1.3.5.7.---.(2n-1)2^n.\ x^n}{n!}$; $n \in Z_+$

SECTION – C

Q. 23. Prove that : $\frac{\sin x}{\cos 3x} + \frac{\sin 3x}{\cos 9x} + \frac{\sin 9x}{\cos 27x} = \frac{\tan 27x - \tan x}{2}$

OR

If α & β are roots of the equation : $a\cos\theta + b\sin\theta = c$, then prove that

(*i*) $\sin(\alpha+\beta) = \frac{2ab}{a^2+b^2}$ **(*ii*)** $\cos(\alpha+\beta) = \frac{a^2-b^2}{a^2+b^2}$.

Q. 24. Using first principle, find the derivative of the function $f(x) = \sqrt{\tan x}$

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

for all $n \geq 1$, $\frac{1}{1.2.3} + \frac{1}{2.3.4} + \frac{1}{3.4.5} + - - - + \frac{1}{n(n+1)(n+2)} = \frac{n(n+3)}{4(n+1)(n+2)}$

Q. 26. 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.

Q. 27. Find the equation of the hyperbola having foci on $(0, \pm\sqrt{10})$ and which passes through **(2 , 3).**

OR

Find the equation of circle circumscribing the triangle formed by the lines $x - y = 0$, $x + y = 2$ and $3x - 4y = 6$.

Q. 28. Show that : $\frac{1\times 2^2 + 2\times 3^2 + 3\times 4^2 + - - - + n\times(n+1)^2}{1^2\times 2 + 2^2\times 3 + 3^2\times 4 + - - - + n^2\times(n+1)} = \frac{3n+5}{3n+1}$

Q. 29. Using short – cut method calculate mean, variance and standard deviation for the following distribution.

Classes	**30 – 40**	**40 – 50**	**50 – 60**	**60 – 70**	**70 – 80**	**80 – 90**	**90 – 100**
Frequency	**3**	**7**	**12**	**15**	**8**	**3**	**2**

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