

TEST PAPER – 2
Vivekanand School Special
Mathematics – XI

Time : 3 hr

Max Marks : 90

General Instructions :

1. All questions are compulsory.
2. The question paper consists of **28 questions** divided into three sections **A, B** and **C**. **Section A** comprises of **10 questions of one mark** each, **Section B** comprises of **14 questions of four marks** each and **Section C** comprises of **04 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 **01 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. The Cartesian product $A \times A$ has 9 elements among which are found $(-1, 0)$ and $(0, 1)$. Find the set A , and the remaining elements of $A \times A$.
- Q. 2. Find the range of the function $f(x) = \frac{|x-1|}{x-1}$
- Q. 3. Find the values of ' k ' for which the line $(k-3)x - (4-k^2)y + k^2 - 7k + 6 = 0$ is parallel to x - axis.
- Q. 4. Find the equation of a straight line inclined at an angle of $\frac{\pi}{6}$ to y - axis and making an intercept of 3 unit on positive x - axis.
- Q. 5. Find the term independent of x in $\left\{ \frac{3x^2}{2} - \frac{1}{3x} \right\}^9$
- Q. 6. If $C(n, 7) = C(n, 3)$, find $C(n, 7)$.
- Q. 7. Find the foot of perpendicular drawn from the point (a, b, c) on yz - plane.
- Q. 8. If $(1, 2, 3)$ and $(2, -3, 1)$ are any two vertices of a triangle with centroid at origin. Find its third vertex.
- Q. 9. If $x = \sqrt{y - \sqrt{y - \sqrt{y - \dots \infty}}}$, Find $\left(\frac{dy}{dx}\right)_{x=1}$
- Q. 10. Evaluate : $\lim_{x \rightarrow 1} \left\{ \frac{x + x^2 + x^3 + \dots + x^{n-1}}{x-1} \right\}$

P.T.O

SECTION – B

Q. 11. Find the domain and range of the following functions $f(x) = \frac{1}{\sqrt{16-x^2}}$

Q. 12. 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. 13. Show that , $\cos^2 x + \cos^2\left\{x + \frac{\pi}{3}\right\} + \cos^2\left\{x - \frac{\pi}{3}\right\} = \frac{3}{2}$.

OR

Find the general solution of the equation ; $\sin x + \sin 3x + \sin 5x = 0$.

Q. 14. Find the number of different 8-letter arrangements that can be made from the letters of the word **DAUGHTER** so that, (i) all vowels occur together.

(ii) Respective position of vowel and consonant remains unchanged.

Q. 15. 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. 16. Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among 100 students. What is the probability that, (i) you both enter the same section?

(ii) you both enter the different section ?

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.

OR

In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of these students is selected at random, find the probability that

(i) The student has opted neither NCC nor NSS.

(ii) The student has opted NSS but not NCC.

Q. 18. Find the equation of the circle which passes through the point (4, 1) and (6, 5) and whose centre lies on the line $4x + y = 16$.

Q. 19. Find the coordinates of foci and vertices, eccentricity length of latus rectum of the hyperbola $\frac{y^2}{4} - \frac{x^2}{9} = 1$

Q. 20. Find the equation of the set of points P, the sum of whose distances from A (4, 0, 0) and B(-4, 0, 0) is equal to 10.

Q. 21. Prove that area of the triangle formed by the lines $y = m_1 x + c_1$; $y = m_2 x + c_2$; $x = 0$ is $\frac{(c_1 - c_2)^2}{2|m_1 - m_2|}$

OR

The slope of a line is double of the slope of another line. If tangent of the angle between them is $\frac{1}{3}$, find the slopes of the lines.

Q. 22. Using *ab – initio* find the derivative of the function $f(x) = \sqrt[3]{\tan x}$

Q. 23. Evaluate : $\lim_{x \rightarrow 0} \left\{ \frac{(a+x)^2 \sin(a+x) - a^2 \sin a}{x} \right\}$

Q. 24. 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 $n^2 - n(4r+1) + 4r^2 - 2 = 0$.

OR

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

SECTION – C

Q. 25. 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

Q. 26. Solve the following inequalities graphically:

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

Q. 27. In a survey of **60** people, it was found that **25** people read newspaper **H**, **26** read newspaper **T**, **26** read newspaper **I**, **9** read both **H** and **I**, **11** read both **H** and **T**, **8** read both **T** and **I**, **3** read all three newspapers.

Find: (i) the number of people who read at least one of the newspapers.

(ii) the number of people who read exactly one newspaper.

Q. 28. Calculate the mean deviation about median age for the age distribution of **100** persons given below:

Age	16 – 20	21 – 25	26 – 30	31 – 35	36 – 40	41 – 45	46 – 50	51 – 55
Number	5	6	12	14	26	12	16	9

OR

The mean and standard deviation of a group of **100** observations were found to be **20** and **3**, respectively. Later on it was found that three observations were incorrect, which were recorded as **21, 21** and **18**. Find the mean and standard deviation if the incorrect observations are omitted.
