Vikas Bharati Public School
Final Terminal Examination (Session 2025-26)
Class: XI (Sample Paper)
Subject: Mathematics (041)

TIME: 3 HRS. **M.M: 80**

General Instructions:

- **This question paper contains 5 sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.**
- **Section A has 18 M.C. Q's and 2 Assertion- Reason based questions of 1 mark each.**
- **Section B has 5 very short answers type questions of 2 marks each.**
- **Section C has 6 short answer type questions of 3 marks each.**
- **Section D has 4 long answer type questions of 5 marks each.**
- **Section E has 3 case-based questions of 4 marks each with subparts**
- **This question paper contains 4 printed pages**

Q No	SECTION -A	Marks
1.	Solution of $\frac{3(x-2)}{5} \leq \frac{5(2-x)}{3}$ is (a) $(-\infty, 2)$ (b) $(-\infty, 12]$ (c) $(-\infty, 2]$ (d) *none of these*	1
2.	The coordinates of the foot of the perpendicular from (-1, 3) to the line 3x - 4y - 16 = 0 are: (a) (68/25, -49/25) (b) (2, 1) (c) (5, -2) (d) (3, -1)	1
3.	The value of $\tan(75^0) - \cot(75^0)$ (a) $2\sqrt{3}$ (b) $2 + \sqrt{3}$ (c) $2-\sqrt{3}$ (d) 1	1
4.	The radian measure of 75^0 is (a) $\frac{2\pi}{12}$ (b) $\frac{4\pi}{3}$ (c) $\frac{5\pi}{12}$ (d) $\frac{19\pi}{72}$	1
5.	If y =5sin2x then find $\frac{dy}{dx}$ at x= $\frac{\pi}{2}$ (a) 0 (b) 5 (c) 10 (d) -10	1
6.	If all observations are equal, then variance is: (a) Maximum (b) Minimum (c) Zero (d) Infinite	1
7.	Set A = {students who participated in tree plantation} = {a, b, c} Set B = {students who participated in cleanliness drive} = {c, d, e} How many students participated to support SDG 13 (Climate Action)? (a) {c} (b) {a, b, c} (c) {c, d, e} (d) {a, b, c, d, e}	1
8.	The distance of point (2,-1) from the line 3x-4y=1 is (a) 2units (b) 7/5 units (c) 9/5 units (d) -9/5 units	1
9.	What will be the coordinates of point on X axis which is equidistant from the pointP(2, 2,2) and point Q (5,5,4) (a) (0,0,0) (b) (49/6,0,0) (c) (-49/6,0,0) (d) (0,0,49/6)	1
10.	A die is rolled. The probability of getting an even prime number is:	1

	(a) 1/6 (b) 1/3 (c) ½ (d) 2/3	
11.	If the letters of the word "MOTHER" are written in all possible orders and listed as in a dictionary, the rank of the word "MOTHER" is: (a) 308 (b) 309 (c) 310 (d) 307	1
12.	$\lim_{x\to 0} \frac{e^{2x}-1}{x}$ is (a) -1 (b) 1 (c) 2 (d) -2	1
13.	The angle between the lines y - ($\sqrt{3}$)x - 5 = 0 and ($\sqrt{3}$)y - x + 6 = 0 is: (a) 30° (b) 45° (c) 60° (d) 90°	1
14.	The focus of $y^2 = -12x$ is (a) 12 (b) -12 (c) -3 (d) 3	1
15.	The domain of the function f(x) = $\sqrt{a^2 - x^2}$ (a) [-a , a] (b) (-a ,a) (c) [-a , 0] (d) [0 ,a)	1
16.	$a + ib$ form of $i^9 + i^{10} + i^{11} + i^{12}$ (a) i (b) -i (c) 0 (d) none of these	1
17.	In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls? (a) 20 (b) 40 (c) 50 (d) 60	1
18.	If 1/3 , x ,3 are in GP , then x is (a) 1 (b) 9 ,-9 (c) 1,-1 (d) 1/9	1
19.	Assertion (A): The range of a relation may contain elements which are not in the domain. Reason (R): The domain and range of a relation are always equal sets. (a) Both A and R are true and R is the correct explanation for A. (b) Both A and R are true and R is not the correct explanation for A. (c) A is true but R is false. (d) A is false but R is true.	1
20.	Assertion (A) : Derivative of sec^2x with respect to x is $2sec^2xtax\ x$ Reason (R) : For derivative of u^n, with respect to x, we can use chain rule or $nu^{n-1}.\frac{du}{dx}$. (a) Both A and R are true and R is the correct explanation for A. (b) Both A and R are true and R is not the correct explanation for A. (c) A is true but R is false. (d) A is false but R is true.	1
	SECTION- B	
21.	Draw the graph of function f: R→R defined by f(x)=x^3. Write its domain and Range.	2
22.	Find the equation of the line passing through the midpoint of the line segment joining the points (1,3) and (2, -1) and parallel to the line 3x- y = 7.	2
23.	How many different words can be formed from the letters of the word INTERMEDIATE?	2
24.	Find $\lim_{x\to 1} f(x)$ where $f(x) = \begin{cases} x^2 - 1 & ,x \le 1 \\ -x^2 - 1 & ,x > 1 \end{cases}$	2

	OR	
	Evaluate $\lim_{x\to o} \frac{(e^{7x}-5^x)}{x}$	
25.	In a school campaign supporting SDG Goal 13, students were surveyed about eco-friendly habits. Let: Event A = student participates in **tree plantation drives,**Event B = student participates in plastic-free campaigns. Given P(A) = 0.5 ,P(B) = 0.35and P(A ∩ B) = 0.2 Find the probability that a randomly selected student participates in tree plantation driv**es** but not in plastic-free campaigns.	2
	SECTION- C	
26.	A mobile service provider company "V-Network" offers different data plans. They define a function f(x) representing the cost of data used in a month, where x is the number of GB used. The company uses a piecewise function to calculate the monthly bill: $f(x) = \begin{cases} 200 & 0 \le x \le 10 \\ 200 + 15(x-10) & x > 10 \end{cases}$ Additionally, they define a relation R on the set of integers Z such that R = {(a, b) : a, b ∈ Z, a - b is divisible by 5}. 1. Find the domain of the function f(x) in the context of data usage. 2. What is the value of f(15)? (Total bill for 15 GB usage).	3
27.	As part of an SDG-6 awareness survey, households in a rural area were studied based on their main source of drinking water. A household uses only one of the following sources: (i)Groundwater(ii) Rainwater harvesting.The probability that a randomly selected household uses groundwater is 0.58 and the probability that it uses rainwater harvesting is 0.42.Name the type of event represented here. Also find the probability that the selected household uses either groundwater or rainwater harvesting.	3
28.	Expand using binomial expansion $\left(\sqrt{\frac{x}{a}} - \sqrt{\frac{a}{x}}\right)^6$.	3
29.	Find the value of x and y if $\frac{(1+i)x-2i}{3+i} + \frac{(2-3i)y+i}{3-i} = i$.	3
	OR	
	If $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3 = x + iy$ then find (x , y).	
30.	The water acidity in a pool is considered normal when the average pH reading of three daily measurements is between 8.2 and 8.5. If the first two pH readings are 8.48 and 8.35 find the range of the pH value for the third reading that will result in the acidity level being normal.	3
31.	Find general solution of $\sin x + \sin^2 x - 2 = 0$.	3

SECTION-D

32. (i) If tan x= $\frac{3}{4}$ and x lies in III quadrant , find $sin\frac{x}{2}$ and $tan\frac{x}{2}$. — 2

(ii) Prove that $cos^2\frac{\pi}{8} + cos^2\frac{3\pi}{8} + cos^2\frac{5\pi}{8} + cos^2\frac{7\pi}{8} = 2$ — 3

33. (i) The mean and variance of 7 observations are 8 and 16, respectively. If five of the observations are 2, 4, 10, 12, 14. Find the remaining two observations. — 3

(ii) Find the mean deviation about the median for the following data: — 2

3, 9, 5, 3, 12, 10, 18, 4, 7, 19, 21

OR

Find the mean deviation about median for the following data : — 5

Marks	0-10	10-20	20-30	30-40	40-50	50-60
frequency	6	8	14	16	4	2

34. Evaluate

(i) $\lim_{x\to 0}\frac{\text{cosec}\,x-\cot x}{x}$ — 2

(ii) $\lim_{x\to 3}\frac{\sqrt{1+x}-\sqrt{1+x^2}}{x}$ — 2

(iii) $\lim_{x\to 2}\frac{(x+8)}{x+2}$ — 1

35. (i) Find the derivative of function $f(x) = \sqrt{x}$ using first principle. — 5

(ii) Differentiate the following function $w.r.t.'x'$

a) $11x^2 + 5x - 5\,cot^2x$ OR b) $\frac{7\,cosecx}{x^2+6x+3}$

OR

i) Find the derivative of function $f(x) = 2x + 3$ using first principle.

ii) Differentiate the following function $w.r.t.'x'$

a) $\frac{7^x+3e^x}{sin8x+tan3x}$ OR b) $(logsin5x + tan3x)^5$

SECTION- E (Case Based Questions)

36. A start-up company decides to invest in digital marketing. In the first month, it spends ₹5,000 on advertisements. To increase its reach, the company decides to increase the advertisement budget every month by a fixed ratio.After analysis, it is observed that the monthly advertisement expenses form a Geometric Progression.The expense in the 5th month is ₹40,000.

(i) Find the monthly advertisement expense in the 3rd month. — 2

(ii) If the company decides to stop advertising once the monthly expense exceeds ₹1,00,000, find the month in which this happens. — 2

37. A satellite dish is designed in the shape of a parabolic reflector so that all incoming signals parallel to its axis get reflected to a single point called the focus. — 2

	The cross-section of the dish is represented by a parabola whose vertex is at the origin and whose axis lies along the positive x-axis. The dish has a depth of 4 m and an aperture width of 16 m. (i)Obtain the equation of the parabola representing the satellite dish. (ii) Check whether the point $(6, 3)$lies inside, on, or outside the parabola.	2
38.	A person standing at the junction (crossing) of two straight paths represented by the equations $2x – 3y + 4 = 0$ and $3x + 4y – 5 = 0$ wants to reach the path whose equation is $6x – 7y + 8 = 0$ in the least time. (i)Find the coordinates of junction . (ii)what is the slope of 6x-7y+8=0 (ii)Find equation of the path that he should follow.	1 1 2