V11M

Virudhunagar District

Common Half Yearly Examination - December 2025

Standard 11

MATHEMATICS

Time Allowed: 3.00 Hours | Maximum Marks: 90

Part - A

i) Answer all the questions. **20×1=20**

ii) Choose the correct (or) more suitable answer.

1) The number of constant functions from a set containing m elements to a set containing n elements is

a) mn b) m c) n d) m+n

2) Let X = {1, 2, 3, 4} and R = {(1, 1), (1, 2), (1, 3), (2, 2), (3, 3), (2, 1), (3, 1), (1, 4), (4, 1)}. Then R is _____.

a) reflexive b) symmetric c) transitive d) equivalence

3) If 3 is the logarithm of 343 then the base is _____.

a) 5 b) 7 c) 9 d) 6

4) The number of roots of $(x+3)^4+(x+5)^4 = 16$ is

a) 4 b) 2 c) 3 d) 8

5) If $f(\theta) = |\sin\theta|+|\cos\theta|$, $\theta \in R$ then $f(\theta)$ is in the interval

a) [0, 2] b) [1, 2] c) $[1, \sqrt{2}]$ d) [0, 1]

6) The principal value of $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$ is _____.

a) $\frac{\pi}{2}$ b) $\frac{\pi}{6}$ c) $\frac{\pi}{4}$ d) $\frac{\pi}{3}$

7) ${}^{n-1}C_r + {}^{n-1}C_{r-1} =$ _____.

a) ${}^{n+1}C_r$ b) ${}^{n-1}C_r$ c) ${}^{n}C_r$ d) ${}^{n}C_{r-1}$

8) If 5 coins are tossed together, the total number of the ways are _____.

a) 5 b) 32 c) 10 d) 25

9) $\lim_{x\to 0} \frac{xe^x - \sin x}{x} =$

a) 1 b) 3 c) 2 d) 0

10) The value of $\frac{1}{2}+\frac{7}{4}+\frac{13}{8}+\frac{19}{16}+\ldots\ldots\ldots =$

a) 14 b) 7 c) 4 d) 6

11) The image of the point (2, 3) the line y = −x is _____.

a) (−3, 2) b) (−3, −2) c) (3, 2) d) (−2, −3)

12) The slope of the line which makes an angle 45° with the line 3x−y = −5 are _____.

a) (1, −1) b) $\left(\frac{1}{2}, -2\right)$ c) $\left(2, \frac{-1}{2}\right)$ d) $\left(1, \frac{1}{2}\right)$

13) The solution of $\begin{vmatrix} 3-x & -6 & 3 \\ -6 & 3-x & 3 \\ 3 & 3 & -6-x \end{vmatrix} = 0$ is

a) 6 b) 0 c) 3 d) −6

14) A vector makes equal angle with the positive direction of the co-ordinate axes. Then each angle is equal to _____.

a) $\cos^{-1}\left(\frac{1}{3}\right)$ b) $\cos^{-1}\left(\frac{2}{3}\right)$ c) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ d) $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$

15) If $a = i - j + 5k$ and $b = 3i - 2k$ then $a.b =$ _____.

a) 1 b) 7 c) -7 d) 8

16) If $y = mx+c$ and $f(0) = f'(0) = 1$ then $f(2)$ is _____.

a) 1 b) 2 c) 3 d) -3

17) If $y = x^3-5x$ then $y''' =$ _____.

a) 6 b) -5 c) $3x^2-5$ d) 6x

18) If two events A and B are independent such that $P(A) = 0.35$ and $P(A \cup B) = 0.6$ then $P(B) =$ _____.

a) $\frac{5}{13}$ b) $\frac{1}{13}$ c) $\frac{4}{13}$ d) $\frac{7}{13}$

19) A number is selected from the set {1, 2, 3, ...20}. The probability that the selected number is divisible by 3 or 4 is _____.

a) $\frac{2}{5}$ b) $\frac{1}{8}$ c) $\frac{1}{2}$ d) $\frac{2}{3}$

20) Limit $\frac{a^x - b^x}{x} =$ _____.

a) log ab b) $\log\left(\frac{a}{b}\right)$ c) $\log\frac{b}{a}$ d) $\frac{a}{b}$

Part - B

i) Answer SEVEN questions only. **7×2=14**

ii) Q.No. 30 is compulsory.

21) If $n(A \cap B) = 3$ and $n(A \cup B) = 10$ find $n[P(A \Delta B)]$.

22) Solve: $\left|\frac{2}{x-4}\right| > 1, x \neq 4.$

23) If in two circles, arcs of same length substend angles 60° and 75° at the center, find the ratio of their radi.

24) How many strings of length 6 can be formed using the letters of the word FLOWER IF either starts with F or ends with R.

25) The length of the perpendicular drawn from the origin to a line is 12 and makes an angle 150° with positive direction of the x axis. Find the equation of the line.

26) Find the area of the parallelogram whose adjacent sides are $i + 2j + 3k$ and $3i - 2j + k$.

27) Find the positive integer n so that $\lim_{x \to 3} \frac{x^n - 3^n}{x - 3} = 27$.

28) Differentiate $y = e^x \sin x$.

29) Given that $P(A) = 0.52$, $P(B) = 0.43$ and $P(A \cap B) = 0.24$ find $P(A \cup B)$ and $P(\bar{A} \cup \bar{B})$.

30) Verify that A is a singular or non-singular matrix if $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$.

Part - C

i) Answer any SEVEN questions only. **7×3=21**

ii) Q.No. 40 is compulsory.

31) Find the domain of $\frac{1}{1-2\sin x}$.

32) Find the value of p for which the difference between the roots of the equation $x^2+px+8 = 0$ is 2.

33) If $A+B = 45^0$ prove that $(1+\tan A)(1+\tan B) = 2$.

34) i) A trust has 25 members (i) How many was 3 officers can be selected?
ii) In how many ways can a President, Vice President and a Secretary can be selected?

35) Compute the sum of first n terms 6+66+666+6666+.....

36) Show that the point (1, 3), (2, 1) and $\left(\frac{1}{2}, 4\right)$ are collinear.

37) Prove that $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^2 = \begin{vmatrix} 2bc-a^2 & c^2 & a^2 \\ c^2 & 2ca-b^2 & a^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix}$.

38) If G is centroid of a triangle ABC prove that $\overrightarrow{GA} + \overrightarrow{GB} + \overrightarrow{GC} = 0$.

39) A problem in Mathematics is given to three students whose chances of solving it are 1/3, 1/4 and 1/5. What is the probability that exactly one of them will solve it.

40) If $y = e^{\sin x}$ find $\frac{dy}{dx}$.

Part - D

Answer all the questions: **7×5=35**

41) Write the values of f at -4, 1, -2, 7, 0 if $f(x) = \begin{cases} -x+4 & \text{if } -\infty < x \le 3 \\ x+4 & \text{if } -3 < x < -2 \\ x^2-x & \text{if } -2 \le x < 1 \\ x-x^2 & \text{if } 1 \le x < 7 \\ 0 & \text{otherwise} \end{cases}$.

(OR)

For what value of K does the equation $12x^2+2Kxy+2y^2+11x-5y+2 = 0$ represents pair of stright lines. Find the angle between of them.

42) State and prove Napier's formulae.

(OR)

A function f is defined as follows $f(x) = \begin{cases} 0 & ; \text{ for } x < 0 \\ x & ; \text{ for } 0 \le x < 1 \\ -x^2 + 4x - 2 & ; \text{ for } 1 \le x < 3 \\ 4 - x & ; \text{ for } x \ge 3 \end{cases}$.

Is the function is continuous?

43) Prove the medians of a triangle are concurrent.

(OR)

If the letters of the word GARDEN are permuted in all possible ways and the strings thus formed are arranged in the dictionary order then find the ranks of the words.

(i) GARDEN (ii) DANGER

44) If x is so small prove that $\sqrt{\frac{1-x}{1+x}} = 1 - x + \frac{x^2}{2}$.

(OR)

Resolve into partial fractions: $\frac{7+x}{(1+x)(1+x^2)}$

45) If $y = (\cos^{-1}x)^2$ prove that $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - 2 = 0$.

(OR)

Using mathematical induction, show that for any number $n \ge 1$,

$$1^3+2^3+3^3+\ldots\ldots\ldots+n^3 = \left[\frac{n(n+1)}{2}\right]^2$$

46) Show that the points of the position vectors $4i + 5j + k$; $-j - k$; $3i + 9j + 4k$ and $-4i + 4j + 4k$ are coplanar.

(OR)

Find x if $\log_2 x + \log_4 x + \log_{16} x = \frac{7}{2}$.

47) A firm manufactures PVC pipes in three plants viz, X, Y and Z. The daily production volumes from the three firms X, Y and Z are respectively 2000 units, 3000 units and 5000 units. It is known from the past experience that 3% of the output from plant X. 4% of the output from plant Y, and 2% of the output from plant Z. A pipe is selected at random from a day's total production if the selected pipe is defective, when is the probability that it was produced by the plant Y?.

(OR)

Prove that $\begin{vmatrix} 1 & x^2 & x^3 \\ 1 & y^2 & y^3 \\ 1 & z^2 & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$.
