

**Tripura  
Class XI  
Mathematics  
Sample Paper-2**

**Time allowed: 3hours**

**Maximum Marks: 100**

**Section-A**

**Question numbers 1 to 6 carry 1 mark each. For each question four options are provided out of which only one is correct. Write the correct option.**

**1x6=6**

1. Slope of a line is not defined, when  $\theta = ?$ 
  - (i)  $45^\circ$
  - (ii)  $60^\circ$
  - (iii)  $30^\circ$
  - (iv)  $90^\circ$
2. The region  $x > -3$  lies
  - (i) To the right of the point  $(-3, 0)$
  - (ii) To the left of the point  $(-3, 0)$
  - (iii) Totally above the point  $(-3, 0)$
  - (iv) Totally below the point  $(-3, 0)$
3. Out of 500 modules tested, 400 modules are from mathematics and 200 are from physics, how many modules are tested from both the subjects:3
  - (i) 500
  - (ii) 600
  - (iii) 200
  - (iv) 100
4. If a, b, c are in A.P. then
  - (i) b is arithmetic mean of a and c
  - (ii)  $2a = b + c$
  - (iii)  $a - b = c - b$
  - (iv)  $b - a = b - c$
5. The length of the transverse axis of the hyperbola  $\frac{x^2}{4} - \frac{y^2}{2} = 1$  is
  - (i) 4
  - (ii) 8
  - (iii) 2

- (iv) 6
6. The distance of (0, 0) from the line  $x + y = 1$  is
- (i)  $\sqrt{2}$  units
- (ii)  $\frac{1}{\sqrt{2}}$  units
- (iii) 3 units
- (iv) 2 units

**Section-B**

Question numbers 7 to 12 carry two marks each.

2x6=12

7. Solve the following.  $\left[ i^{18} + \frac{1}{i^{25}} \right]^2$
8. Find n given that,  ${}^{n-1}P_3 : {}^nP_4 = 1 : 9$
9. Let  $f = \left\{ x; \frac{x^2}{1+x^2}, x \in \mathbb{R} \right\}$  be a function from  $\mathbb{R}$  to  $\mathbb{R}$ . Determine the domain and range of f.
10. If  $f(x) = (x + 1)^2$  find  $\frac{f(4.2) - f(1)}{5.2 - 2}$ .
11. Solve the given quadratic equation:  $9x^2 - 12x + 20 = 0$
12. There are 10 points in a plane, no three of which lie on the same straight line, except four points which are collinear. Find
- (i) The number of straight lines drawn from these points
- (ii) The number of triangles with vertices as these points

**Section-C**

Questions numbers 13 to 25 carry 4 marks each.

4x13=52

13. Prove that  $\cos^2 x + \cos^2 \left( x + \frac{\pi}{3} \right) + \cos^2 \left( x - \frac{\pi}{3} \right) = \frac{3}{2}$
14. Show that  $10^n + 3 \cdot 4^{n+2} + 5$  is divisible by 9 for each natural number  $n$ .

**OR**

Prove that:  $1 + \frac{1+2}{2} + \frac{1+2+3}{3} + \dots + \frac{1+2+\dots+n}{n} = \frac{n(n+3)}{4}$

15. If three lines whose equations are  $y = m_1x + c_1$ ,  $y = m_2x + c_2$  and  $y = m_3x + c_3$  are concurrent, then find (i) the condition of concurrence of the three lines (ii) the point of concurrence.

**OR**

A beam is supported at its ends by supports which are 14 cm apart. Since the load is concentrated at its centre, there is a deflection of 5 cm at the centre and the deflected beam is in the shape of a parabola. How far from the centre is the deflection of 2 cm?

16. The first three terms in the binomial expansion of  $(a + b)^n$  are given to be 729, 7290 and 30375 respectively. Find a, b and n.
17. Graphically represent the solution set of the pair of linear inequalities,  
 $x + y \leq 5, 4x + y \geq 4, x \leq 4, y \leq 3$ .
18. If in a  $\Delta ABC$ ,  $\frac{b+c}{12} = \frac{c+a}{13} = \frac{a+b}{15}$ , then prove that:  $\frac{\cos A}{2} = \frac{\cos B}{7} = \frac{\cos C}{11}$ .
19. Differentiate:  $y = \sqrt{\sin x}$  by using first principle
20. Find the variance for the following data. 5, 6, 4, 2, 3, 6, 9
21. Find the coefficient of  $x^6y^3$  in the expansion of  $(x + 2y)^9$ .
22. If  $\tan \frac{\theta}{2} = \sqrt{\frac{a-b}{a+b}} \tan \frac{\phi}{2}$ , then prove that  $\cos \theta = \frac{a \cos \phi + b}{a + b \cos \phi}$ .
23. Find the sum of the following series upto n terms:  $\frac{1^3}{1} + \frac{1^3+2^3}{1+3} + \frac{1^3+2^3+3^3}{1+3+5} + \dots +$
24. Find the equations of the straight line(s) through (7, 9) and making an angle of  $60^\circ$  with  $x - \sqrt{3}y - 2\sqrt{3}$ .
25. For all  $n \geq 1$ , prove using Principle of Mathematical Induction  
 $\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots + \frac{1}{n(n+1)} = \frac{n}{n+1}$

**Section-D**

Question numbers 26 to 30 carry 6 marks each

6x5=30

26. How many litres of water will have to be added to 1125 litres of a 45% solution of acid so that the resulting mixture will contain more than 25% but less than 30% acid content?
27. Calculate mean, variance and standard deviation for the following data
- |           |         |         |         |         |         |         |          |
|-----------|---------|---------|---------|---------|---------|---------|----------|
| Classes   | 30 - 40 | 40 - 50 | 50 - 60 | 60 - 70 | 70 - 80 | 80 - 90 | 90 - 100 |
| frequency | 3       | 7       | 12      | 15      | 8       | 3       | 2        |
28. Identify the conic represented by the equation  $x^2 - 4y^2 = 4$ . Find the length of axes and latus rectum, vertices, eccentricity, foci and equation of directrix.
29. (i) Find the derivative of the given function using the first principle:

$$f(x) = \cos\left(x - \frac{\pi}{16}\right)$$

(ii) Evaluate:  $\lim_{x \rightarrow \frac{\pi}{2}} \frac{5^{\cos x} - 1}{\frac{\pi}{2} - x}, x \neq \frac{\pi}{2}$ .

30. Show by mathematical induction that the sum to n terms of the series

$$1^2 + 2 \times 2^2 + 3^2 + 2 \times 4^2 + 5^2 + 2 \times 6^2 + \dots \text{ is } S_n = \begin{cases} \frac{n(n+1)^2}{2}, & \text{when } n \text{ is even} \\ \frac{n^2(n+1)}{2}, & \text{when } n \text{ is odd} \end{cases}$$