T.S. Intermediate Board Mathematics IB Model Paper

(Extracted from tsbie.cgg.gov.in)

Mathematics Paper - I(B)

Time : 3 Hours | *Max. Marks : 75*

SECTION A

I. Very Short Answer Type Questions : **10 × 2 = 20**

(i) Attempt **ALL** questions.

(ii) Each question carries **TWO** marks.

1. Find the value of x, if the slope of the line passing through (2, 5) and (x, 3) is 2.

2. Find the value of p, if the straight lines x + p = 0, y + 2 = 0 and 3x + 2y + 5 = 0 are concurrent.

3. If (3, 2, -1), (4, 1, 1) and (6, 2, 5) are three vertices and (4, 2, 2) is the centroid of a tetrahedron, find the fourth vertex.

4. Find the equation of the plane passing through (1, 1, 1) and parallel to the plane x + 2y + 3z – 7 = 0.

5. Compute :

$$\lim_{x\to\infty} \frac{11x^3 - 3x + 4}{13x^3 - 5x^2 - 7}.$$

6. Compute :

$$\lim_{x\to 0} \frac{e^{3+x} - e^3}{x}.$$

7. If y = $e^{a \sin^{-1} x}$, then prove that :

$$\frac{dy}{dx} = \frac{ay}{\sqrt{1-x^2}}.$$

8. *If y =* $\log(\cosh 2x)$*, find :*

$$\frac{dy}{dx}.$$

9. *If the increase in the side of a square is 4%, then find the approximate percentage of increase in the area of the square.*

10. *Verify Rolle's theorem for the function :*

$$y = f(x) = x^2 - 1 \text{ on } [-1, 1].$$

SECTION B

II. Short Answer Type Questions : ***5 × 4 = 20***

(i) Answer ***ANY FIVE*** *questions.*

(ii) Each question carries ***FOUR*** *marks.*

11. *Find the equation of the locus of P, if :*

A = (2, 3), B = (2, - 3) and PA + PB = 8.

12. *When the origin is shifted to the point (2, 3), the transformed equation of a curve is* $x^2 + 3xy - 2y^2 + 17x - 7y - 11 = 0$*. Find the original equation of the curve.*

13. *Find the equation of the line perpendicular to the line 3x + 4y + 6 = 0 and making an intercept – 4 on the X-axis.*

14. *If f, given by* $f(x) = \begin{cases} k^2x - k & if\ x \geq 1 \\ 2 & if\ x < 1 \end{cases}$ *is a continuous function on R, then find the value of k.*

15. *Find the derivative of the function f(x) = tan 2x from the first principle.*

16. *Find the equation of the tangent and the normal to the curve* $y^4 = ax^3$ *at (a, a).*

17. *The volume of a cube is increasing at the rate of 8 cm^3/sec. How fast is the surface area increasing when the length of an edge is 12 cm ?*

SECTION C

III. Long Answer Type Questions : 5 × 7 = 35

(i) Answer ***ANY FIVE*** *questions.*

(ii) Each question carries ***SEVEN*** *marks.*

18. *Find the circumcentre of the triangle whose vertices are given by (1, 3), (0, –2) and (–3, 1).*

19. *Show that the lines joining the origin to the points of intersection of the curve $x^2 - xy + y^2 + 3x + 3y - 2 = 0$ and the straight line $x - y - \sqrt{2} = 0$ are mutually perpendicular.*

20. *Show that the product of the perpendicular distances from a point (α, β) to the pair of straight lines $ax^2 + 2hxy + by^2 = 0$ is :*

$$\frac{|a\alpha^2 + 2h\,\alpha\beta + b\beta^2|}{\sqrt{(a-b)^2 + 4h^2}}.$$

21. *Find the angle between the lines whose direction cosines are given by the equation 3l + m + 5n = 0 and 6mn – 2nl + 5 lm = 0.*

22. *If $f(x) = \sin^{-1}\sqrt{\frac{x-\beta}{\alpha-\beta}}$ and $g(x) = \tan^{-1}\sqrt{\frac{x-\beta}{\alpha-x}}$, then prove that :*

$$f'(x) = g'(x) \qquad (\beta < x < \alpha).$$

23. *Find the lengths of subtangent, subnormal at a point t on the curve x = a (cos t + t sin t), y = a(sin t – t cos t).*

24. *Find two positive numbers whose sum is 15 so that the sum of their squares is minimum.*