Mathematics Model Paper(I-B)

Intermediate I - Year

Time: 3 HRS   **Max. Marks: 75**

SECTION - I

I.Very Short Answer Questions. Answer all Questions. Each Question carries Two marks.

$$10 \times 2 = 20 \, M$$

1. Find the equation of the straight line whose distance from the origin is 4, if the normal ray from the origin to the straight line makes an angle of 135° with the positive direction of the X-axis.

2. Find the value of k, if the angle between the straight lines $4x - y + 7 = 0$ and $kx - 5y - 9 = 0$ and is 45°.

3. Find the in centre of the triangle formed by the points $(0, 0, 0)$, $(3, 0, 0)$ and $(0, 4, 0)$.

4. Find the equation to the plane parallel to ZX– plane and passing through $(0, 4, 4)$.

5. Compute $\lim\limits_{x \to 0} \dfrac{\sin(\pi \cos^2 x)}{x^2}$

6. Compute $\lim\limits_{x \to \infty} \dfrac{11x^3 - 3x + 4}{13x^3 - 5x^2 - 7}$

7. If $f(x) = 7^{x3 + 3x}$ $(x > 0)$ then find $f'(x)$

8. If $y = ae^{nx} + be^{-nx}$ then prove that $y'' = n^2 y$

9. Find dy and δy of $y = f(x) = x^2 + x$ at $x = 10$ when $\delta x = 0.1$

10. Verify the Roll's theorem for $f(x) = x(x + 3) e^{-x/2}$ in $[-3, 0]$

SECTION - II

II.Short Answer Questions. Ans-wer any 'Five' Questions.Each Question carries 'Four' marks. $$5 \times 4 = 20 \, M$$

11. If A $(2, 3)$ and B$(-3, 4)$ are two points. Find the locus of P so that the area of triangle PAB is 8.5 sq units.

12. When the axis are rotated through an angle $\dfrac{\pi}{6}$. Find the transformed equation of

$$x^2 + 2\sqrt{3}\, xy - y^2 = 2a^2$$

13. Find the orthocenter of the triangle whose vertices are (–5, –7), (13, 2) and (–5, 6).

14. Find real constants a, b so that the function f given by f (x) = $\begin{cases} \sin x & \text{if } x \le 0 \\ x^2 + a & \text{if } 0 < x < 1 \\ bx + 3 & \text{if } 1 \le x \le 3 \\ -3 & \text{if } x > 3 \end{cases}$ is

continuous on R.

15. Find the derivative of sin2x from the first principle.

16. The volume of a cube is increasing at a rate of 9 cubic centimeters per second. How fast is the surface area increasing when the length of the edge is 10 centimeters?

17. Show that the curves $y^2 = 4(x+1)$ and $y^2 = 36(9–x)$ intersect orthogonally.

SECTION - III

III.Long Answer Questions. Ans-wer any 'Five' Questions. Each Question carries 'Seven'
marks. $5 \times 7 = 35\ M$

18. If Q (h, k) is the foot of the perpendicular from P (x_1, y_1) on the straight line ax+by+c=0 then show that $(h – x_1) : a = (k – y_1) : b = – (ax_1+by_1+c) : (a^2 + b^2)$

19. Find the lines joining the origin to the points of intersection of the curve $7x^2 – 4xy + 8y^2 + 2x – 4y – 8 = 0$ with the line 3x–y–2=0 and also the angle between them.

20. Show that the pair of lines $3x^2 + 8xy – 3y^2 = 0$ and $3x^2 + 8xy – 3y^2 + 2x – 4y–1=0$ form a square.

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

22. If $y = \text{Tan}^{-1} \left[\dfrac{\sqrt{1+x^2} + \sqrt{1-x^2}}{\sqrt{1+x^2} - \sqrt{1-x^2}} \right]$ for $0 < |X| < 1$, find $\dfrac{dy}{dx}$

23. If the tangent at any point on the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ intersects the coordinate axes in A and B, then show that the length AB is a constant.

24. If the curved surface of right circular cylinder inscribed in a sph-ere of radius r in maximum. Show that the height of cylinder is $\sqrt{2}r$.