Date: 26-04-2017   Dept. No.   Max. : 100 Marks
09:00-12:00

PART - A

Answer ALL the questions: **(10 X 2 = 20 Marks)**

1. Find the nth derivative of $y = \sin(ax + b)$.

2. Find the polar subtangent and polar subnormal of the curve $r = e^{\theta \cot\alpha}$

3. Write the caretesian formula for the radius of curvature.

4. Define involute.

5. Find the equation, with rational coefficients one of whose roots is $\sqrt{5} + \sqrt{2}$

6. Calculate the sum of the cubes of the roots of the equation $x^4 + 2x + 3 = 0$

7. Show that $\cosh^2 x - \sinh^2 x = 1$

8. Write down the expansion for $\sin n\theta$.

9. Write the polar equation of a conic.

10. Find the asymptotes of the hyperbola $3x^2 - 5xy - 2y^2 + 17x + y + 14 = 0$

PART - B

Answer any FIVE questions: **(5 X 8 = 40 Marks)**

11. Find the nth differential coefficient of $\cos x . \cos 2x . \cos 3x$.

12. Find the slope of the tangent with the initial line for the cardioid
$r = a(1 - \cos\theta)$ at $\theta = \frac{\pi}{6}$.

13. What is the radius of curvature of the curve $x^4 + y^4 = 2$ at the point $(1,1)$?

14. The equation $x^3 - 3x + 1 = 0$ has a root between 1 and 2. Calculate it to three places of decimals by using Horner's method.

15. Express $\frac{\sin 6\theta}{\sin \theta}$ in terms of $\cos\theta$.

16. Separate into real and imaginary parts $\tan^{-1}(x + iy)$.

17. Derive the polar equation $\frac{l}{r} = 1 + e \cos\theta$ of a conic.

18. Show that in a conic the semi-latus rectum is the harmonic mean between the segments of a fical chord.

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PART - C

Answer any TWO questions: **(2 x 20=40 Marks)**

19. If $y = \sin(m\sin^{-1} x)$, prove that $(1-x^2)y_2 - xy_1 + m^2y = 0$ and

$(1-x^2)y_{n+2} - (2n+1)xy_{n+1} + (m^2-n^2)y_n = 0$

20. a) For the curves $x^2 = 4y$ and $y^2 = 4x$, find the angle of intersection. b) Prove that the radius of curvature at any point of the cycloid

$x = a(\theta + \sin\theta)$ and $y = a(1-\cos\theta)$ is $4a\cos\frac{\theta}{2}$. **(12+8)**

21. Solve the equation $81x^3 - 18x^2 - 36x + 8 = 0$ whose roots are in harmonic progression.

22. a) Sum to infinity the series $\cos\alpha + \frac{1}{2}\cos(\alpha+\beta) + \frac{1}{2}\cdot\frac{3}{4}\cos(\alpha+2\beta) + \cdots$

b) If e and e_1 are two extremities of hyperbola and its conjugate show that $e^{-2} + e_1^{-2} = 1$

(12+8)

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