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D.K.M.COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1

SEMESTER EXAMINATIONS

NOVEMBER – 2017

15CAMA1A/15CAMA3A

ALLIED: MATHEMATICS - I

Time : 3 Hrs

Max. Marks : 75

SECTION-A (10 x 2 = 20)

Answer ALL the questions.

1. Resolve into partial fractions $\frac{x}{(x-1)(x+2)}$.

2. Prove that $\frac{e+1}{e-1} = \frac{\frac{1}{1} + \frac{1}{3} + \frac{1}{5} + \dots}{\frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \dots}$

3. Find α, β, γ are the roots of $2x^3 + 3x^2 + 5x + 6 = 0$ find $\sum \alpha, \sum \alpha \beta$ and $\alpha \beta \gamma$.

4. Diminish the roots of an equation $x^3 - 6x^2 + 11x - 6 = 0$ by 2.

5. Define symmetric matrix and given an example.

6. Prove that the matrix $\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{-1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}$ is orthogonal.

7. Write the formula for expansion of $\tanh \theta$.

8. Separate into real and imaginary parts of $\sin(x + iy)$.

9. Define radius of curvature in Cartesian coordinates.

10. If $x = r \cos \theta, y = r \sin \theta$, find $\frac{\partial(x,y)}{\partial(r,\theta)}$.

SECTION-B (5 x 5 = 25)

Answer any FIVE of the following questions.

11. Sum the series $1 + \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \dots$.

12. Find the sum to infinity of the series $1 + \frac{3}{2!} + \frac{5}{3!} + \frac{7}{4!} + \dots \infty$.

13. Find the condition that the roots of the equation $x^3 + px^2 + qx + r = 0$ may be in A.P.

14. Solve the equation $x^4 - 11x^2 + 2x + 12 = 0$ given that $\sqrt{5} - 1$ is a root.

15. State Cayley – Hamilton theorem and use it to find inverse of $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$.

16. Express $\cos 6\theta$ in terms of $\cos \theta$.

17. Prove that $\tanh^{-1} x = \frac{1}{2} \log \left[\frac{1+x}{1-x} \right]$.

18. Find the n^{th} derivative of $\frac{x-2}{(x+2)(x-1)^2}$.

SECTION-C (3 x 10 = 30)

Answer ALL the questions.

19. (a) Sum to infinity of the series $\frac{1}{1.2.3} + \frac{5}{3.4.5} + \frac{9}{5.6.7} + \dots$

(Or)

(b) Sum the series $\frac{1^2}{1!} + \frac{1^2+2^2}{2!} + \frac{1^2+2^2+3^2}{3!} + \dots + \frac{1^2+2^2+\dots+n^2}{n!} + \dots$

20. (a) Solve $6x^6 - 25x^5 + 31x^4 - 31x^2 + 25x - 6 = 0$.

(Or)

(b) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$.

21. (a) Prove that $\cos 7\theta$ in terms of $\cos \theta$ and hence prove that

$$\frac{\cos 7\theta}{\cos \theta} = 64\cos^6 \theta - 112\cos^4 \theta + 56\cos^2 \theta - 7.$$

(Or)

(b) If $y = \sin(m \sin^{-1} x)$ then show that $(1 - x^2)y_{n+2} - (2n + 1)xy_{n+1} + (m^2 - n^2)y_n = 0$.

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