LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

U.G. DEGREE EXAMINATION – **ALLIED**

SECOND SEMESTER – **APRIL 2019**

MT 2100– MATHEMATICS FOR COMPUTER SCIENCE

Date: 11-04-2019 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Part A

Answer any FOUR questions: **(4 x 10 = 40)**

1. Show that the equations $x+2y-z=3,\ 3x-y+2z=1,\ 2x-2y+3z=2, x-y+z=-1.$ are consistent and solve them.
2. Prove that $\frac{\cos 7\theta}{\cos\theta} = 64\cos^6\theta - 112\cos^4\theta + 56\cos^2\theta - 7$.
3. Find the condition that the roots of the equation $ax^3+3bx^2+3cx+d=0$ may be in geometric progression.
4. Verify Euler's theorem for the function $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$.
5. Prove that $\int_0^{\frac{\pi}{2}} \frac{(sinx)^{3/2}}{(sinx)^{3/2}+(cosx)^{3/2}}\, dx = \frac{\pi}{4}$
6. Solve the equation $(D^2+4D+4)y = e^{-2x}$.
7. Solve $xp+yq=x$.
8. Determine the root of $xe^x-3=0$ correct to three decimals using RegulaFalsi method.

Part B

Answer any THREE questions: **(3 x 20 = 60)**

9\. a) Prove that $\frac{\sin 7\theta}{\sin\theta} = 7 - 56\, sin^2\theta + 112\, sin^4\theta - 64\, sin^6\theta.$

b) Find the Eigen values and Eigen vectors of the matrix $\begin{pmatrix} 4 & -20 & -10 \\ -2 & 10 & 4 \\ 6 & -30 & -13 \end{pmatrix}$.

10\. a) Prove that $\cos^5\theta \sin^4\theta = \frac{1}{2^8}\left[\cos 9\theta + \cos 7\theta - 4\cos 5\theta - 4\cos 3\theta + 6\cos\theta\right]$.

b) Solve the reciprocal equation $x^5+4x^4+x^3+x^2+4x+1=0$.

11\. a) Find the radius of curvature of the curve $xy^2 = a^3 - x^3$ at the points $(a,0)$.

b) Prove that $\int_0^{\pi/4} \log(1+\tan\theta)\, d\theta = \frac{\pi}{8}\log 2$.

12\. a) Solve the equation $(D^2+5D+4)y = e^x$.

b) Find the real root of $x^3-2x-5=0$ by false position method correct to 3 decimal places.

13. a) The velocity of a particle at distance S from a point on it's path is given by the following table

S(ft)	0	10	20	30	40	50	60
V(ft/s)	47	58	64	65	61	52	38

Estimate the time taken to travel 60 ft using Trapezoidal rule.

b) Find all the characteristic roots and the associated characteristic vectors of the matrix

$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}.$$

14. a) Solve the reciprocal equation $6x^5 - x^4 - 43x^3 + 43x^2 + x - 6 = 0$.

b) If $u = \tan^{-1}\left(\frac{x^3+y^3}{x+y}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$.

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