LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.C.A. DEGREE EXAMINATION – **COMPUTER APPLICATIONS**

SECOND SEMESTER – **APRIL 2018**

MT 2101 / CA 2100– MATHEMATICS FOR COMPUTER APPLICATIONS

Date: 28-04-2018 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

PART – A

ANSWER **ALL** QUESTIONS: (10 X 2 = 20)

1. Show that $A = \begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$ is orthogonal.
2. If α and β are the roots of the equation $2x^2 + 3x + 5 = 0$, find α+β, αβ.
3. Write the Newton-Raphson formula.
4. Define unitary matrix.
5. Prove that $\cos h^2 x - \sin h^2 x = 1$.
6. Transform the equation $3x^3 + 4x^2 + 5x - 6 = 0$ into one in which the coefficient of x^3 is unity.
7. Find $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ if $u = x^2 + y^2$.
8. Integrate e^{5x+2} with respect to *x*.
9. Evaluate the double integral $\int_0^1 \int_0^{x^2} (x^2 + y^2)\, dy\, dx$.
10. Form partial differential equation by eliminating arbitrary constants from $z = ax + by + a^2 + b^2$.

PART – B

ANSWER ANY **FIVE** QUESTIONS: (5 X 8 = 40)

11. Prove that $-64\sin^7\theta = \sin 7\theta - 7\sin 5\theta + 21\sin 3\theta - 35\sin\theta$.
12. Find the rank of the matrix $\begin{pmatrix} 1 & 2 & 1 \\ -1 & 0 & -2 \\ 2 & 1 & 3 \end{pmatrix}$
13. Find the condition that the roots of the equation $ax^3 + 3bx^2 + 3cx + d = 0$ may be geometric progression. Solve the equation $27x^3 + 42x^2 - 28x - 8 = 0$ whose roots are in geometric progression.
14. Verify Euler's theorem for the function $u = x^2 + y^2 + 2xy$.

15. Evaluate $\int x^3 \sin 2x dx$, using Bernoulli's formula.

16. Solve: $(D^2 - 5D - 6)\,y = e^{4x} + \cos x$.

17. Determine the root of $xe^x - 3 = 0$ correct to three decimal places, using the method ofFalse position.

18. Using Trapezoidal rule with $h = \frac{1}{2}$ and $h = \frac{1}{4}$ to evaluate $\int_0^1 f(x)dx$ using the table below:

X	0.000	0.250	0.500	0.750	1.000
f(x)	0.79788	0.77334	0.70413	0.60227	0.48394

and find the solution by Simpson's $\frac{3}{8}$ rule .

PART – C

ANSWER ANY TWO QUESTIONS: **(2 X 20 = 40)**

19. (a) Verify Cayley –Hamilton theorem for the matrix $\begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$

(b) Find the real and imaginary partsof $\tan(x + iy)$. **(10+10)**

20. (a) Solve equation $6x^6 - 35x^5 + 56x^4 - 56x^2 + 35x - 6 = 0$.

(b) Find the curvature of the curve $x^3 + y^3 = 3axy$ at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$. **(10+10)**

21. a) Show that the volume of the solid generated by the revolution of the upper half of the loop of the curve $y^2 = x^2(2 - x)$ is $\frac{4}{3}\pi$.

(b) Find the area of the loop of the curve $4y^2 = (x-5)^2(x-1)$. **(10+10)**

22. (a) Evaluate $\iiint xyz\,dx\,dy\,dz$ taken through the positive octant of the sphere $x^2 + y^2 + z^2 = a^2$

(b) Solve $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = \sin t$ given $y = \frac{dy}{dt} = 0$ when $t = 0$. **(10+10)**

****