Register No. : | | | | | | | | | | |

QP-Code : 20SC51T

Makeup Examination – Sept. 2023
V Semester Diploma Examination

PAPER-1: APPLIED MATHEMATICS (20SC51T)

(Exam Date / Time: 23rd Sep. 2023 / 9.00 AM)

Time: 3 hours **Max Marks: 100**

SECTION - I

1.(a) Find the angle between the radius vector and the tangent for the curve $r^2 = a^2 \cos 2\theta$ (10)

(b) Find the Pedal equation of the curve $\frac{2a}{r} = 1 + \cos\theta$ (10)

2.(a) Show that the pair of curves $r = a^{e^\theta}$, $r^{e^\theta} = b$ intersect each other orthogonally. (10)

(b) Find the radius of curvature of the curve x = acost , y = asint. (10)

SECTION -II

3. (a) Obtain Maclaurin's series expansion of $\log(1+x)$ upto x^4 (8)

(b) Solve $(4xy + 3y^2 - x)dx + x(x + 2y)dy = 0$ (6)

(c) Solve $(D^2 + 5D + 6)y = e^x$ (6)

4. (a) Expand $\sin(e^x - 1)$ using Maclaurin's series expansion upto the term containing x^4 (8)

(b) Solve $\tan y \frac{dy}{dx} + \tan x = \cos y \cos^2 x$ (6)

(c) Solve $\frac{d^2y}{dx^2}$ + y =secx tanx using variation of parameters (6)

SECTION - III

5. (a) Solve the following system of equation by Gauss Elimination method : (10)

2x - y + x = 9,
x + y + z = 6
x - y + z =2

(b) Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy \, dy \, dx$ by changing order of integration. (10)

6. (a) Solve by Gauss-Jordan Method (10)

$x + 2y + z = 8$

$2x + 3y + 4z = 20$

$4x + 3y + 2z = 16$

(b) Evaluate $\int_{x=0}^{x=1} \int_{y=0}^{y=\sqrt{1-x^2}} \int_{z=0}^{z=\sqrt{1-x^2-y^2}} xyz \, dz \, dy \, dx$ (10)

SECTION - IV

7. (a) If $\vec{F} = (x + y + 1)i + j - (x + y)k$ then show that $\vec{F}.curl\vec{F} = 0$ (6)

(b) Form the PDE by eliminating arbitrary constants a and b from $z = (x - a)^2 + (y - b)^2$ (6)

(c) Solve $p + q = \frac{z}{a}$ by Lagrange's method. (8)

8. (a) Find the directional derivatives of $\phi = xy^2 + yz^3$ at $(2,-1,1)$ along $i + 2j + 2k$ (7)

(b) Evaluate $\int_C (xy + y^2)dx + x^2dy)$ .where is C is the closed curve of the region bounded by $y = x$ and $y = x^2$ using Green's Theorem. (6)

(c) Derive one dimensional heat equation. (7)

SECTION - V

9. (a) Compute the fourth root of 12 correct to 3 decimal places using Regula Falsi method. (10)

(b) Using Lagrange's Interpolation formula, fit a polynomial for following data to find y at x = 4 (10)

x	0	1	2	5
y	2	3	12	147

10. (a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's $\frac{1}{3}^{rd}$ rule taking 4 equal strips and hence deduce an appropriate value of π. (10)

(b) Apply Runge Kutta fourth order method to find an appropriate value of y when x=0.2 given that $\frac{dy}{dx} = x + y$ and y = 1 when x= 0 (10)