

UNIT - IV

8. (a) Given the equation $\frac{dy}{dx} = 3x^2 + 1$ with $y(1) = 2$ Estimate $y(2)$ by Euler's method using $h = 0.5$. 7.5
- (b) Use Runge-Kutta method of order '4' to estimate $y(0.4)$ when $\frac{dy}{dx} = x^2 + y^2$ with $y(0) = 0$. Assume $h = 0.2$ 7.5
9. (a) Solve the Poisson equation $\nabla^2 f = 2x^2y^2$ over the square domain $0 \leq x \leq 3, 0 \leq y \leq 3$ with $f = 0$ on the boundary and $h = 1$. 7.5
- (b) Solve the problem $2f_{xx}(x, t) = f_t(x, t), 0 < t < 1.5$ and $0 < x < 4$ given initial condition $f(x, 0) = 50(4 - x), 0 \leq x \leq 4$ and the boundary conditions $f(0, t) = 0, 0 \leq t \leq 1.5, f(4, t) = 0, 0 \leq t \leq 1.5$. 7.5

Roll No.

3094

B. Tech. 4th Semester (ECE)
Examination – July, 2021

MATHEMATICS-III (Partial Differential Equations and

Numerical Methods)

Paper : BSC-MATH-202-G

Time : Three hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

1. (a) Define partial differential equation and its application.
- (b) Define the convergence of Newton-Raphson method.
- (c) What do you mean by Algebraic Equation? Quote an example.
- (d) Define ordinary differential equation and its solution with an example.
- (e) Explain numerical differentiation and quote an example.

- (f) Define Interpolation and what are the various methods of Interpolation ? 2.5 × 6 = 15

UNIT - I

2. (a) Form a partial differential equation by eliminating arbitrary function from : 7.5

$$z = xf_1(x+y) + f_2(x+y)$$

- (b) Solve Lagrange's linear partial differential equation : 7.5

$$y^2 zp + x^2 zq = xy^2$$

3. (a) Solve the differential equation : 7.5

$$zxp + yzq = xy$$

- (b) Solve by Charpit's method : 7.5

$$pxy + pq + qy = yz$$

UNIT - II

4. (a) Solve the homogeneous partial differential equation : 7.5

$$\frac{\partial^2 z}{\partial x^2} - 5 \frac{\partial^2 z}{\partial x \partial y} + 6 \frac{\partial^2 z}{\partial y^2} = e^{x+y}$$

- (b) Solve non-homogeneous partial differential equation : 7.5

$$(D - D' - 1)(D - D' - 2)z = e^{2x-y}$$

5. (a) Using method of separation of variables, solve partial differential equation : 7.5

$$4 \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$$

given that $u = 3e^{-y} - e^{-5y}$; $x = 0$

- (b) Solve the boundary value problem : 7.5

$$\frac{\partial^2 y}{\partial t^2} = 4 \frac{\partial^2 y}{\partial x^2}$$

Given that $y(0, t) = y(5, t) = 0$; $y(x, 0) = 0$,

$$\left(\frac{\partial y}{\partial t} \right)_{t=0} = f(x)$$

UNIT - III

6. (a) Find the root of equation $x^2 - 4x - 10 = 0$ using Bisection method. 7.5

- (b) Compute a root of each of the following equation : 7.5

$$x^2 - 5x + 6 = 0, x_0 = 5$$

using Newton-Raphson method.

7. (a) Estimate the value of 'sin θ ' at $\theta = 25^\circ$ using Newton-Gregory forward difference formula with the help of following table : 7.5

θ	10	20	30	40	50
sin θ	0.1736	0.3420	0.5000	0.6428	0.7660

- (b) Evaluate the following integral using Simpson's $\frac{1}{3}$ rd rule $\int_{-1}^1 e^x dx$. 7.5