

Roll No.

ED–2872

B. C. A. (Part III) EXAMINATION, 2021

Paper Second

DIFFERENTIAL EQUATION AND FOURIER SERIES

Time : Three Hours

Maximum Marks : 50

Note : All questions are compulsory. Attempt any *two* parts from each question. All questions carry equal marks. Only simple calculator is allowed not scientific calculator.

Unit—I

1. (a) Solve :

$$y \sin 2x dx - (y^2 + \cos^2 x) dy = 0$$

(b) Solve :

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

(c) Solve :

$$y = -px + x^4 p^2$$

$$\text{where } p = \frac{dy}{dx}.$$

P. T. O.

Unit—II

2. (a) Find the orthogonal trajectories of the family of cardioids $r = a(1 - \cos\theta)$, where a is a parameter.

- (b) Solve :

$$(D^2 - 3D + 2)y = 6e^{2x} + \sin 2x$$

where $D = \frac{d}{dx}$.

- (c) Solve :

$$\frac{x^2 d^2 y}{dx^2} - \frac{x dy}{dx} - 3y = x^2 \log x$$

Unit—III

3. (a) Find the differential equation of all sphere whose center lies on z axis.

- (b) Find the computer integral :

$$pq = xy$$

- (c) Solve partial differential equation :

$$\frac{\partial^2 z}{\partial x^2} - \frac{2\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin x$$

Unit—IV

4. (a) Find the Fourier series for $f(x)$ in interval $(-\pi, \pi)$, where $f(x)$ is defined as follows :

$$f(x) = \begin{cases} -1, & \text{when } -\pi < x < 0 \\ 1, & \text{when } 0 < x < \pi \end{cases}$$

[3]

- (b) Find the half range cosine series for $f(x) = x$ in the range $0 < x < 2$.
- (c) Obtain the fourier series for the function $f(x)$, where

$$f(x) = \begin{cases} -x, & \pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$$

Unit—V

5. (a) Explain term by term differentiation of Fourier series.
- (b) Discuss the Gibbs phenomenon for the function :

$$f(x) = \begin{cases} 1, & \text{when } -\pi < x < 0 \\ -1, & \text{when } 0 < x < \pi \end{cases}$$

- (c) Solve two dimensional Laplace equation which depends only on $r = \sqrt{x^2 + y^2}$.