**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 :

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

where $p = \dfrac{dy}{dx}$.

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## 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 $D = \dfrac{d}{dx}$.

(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 :

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

(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 :

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

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

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