

GO-99-21

Roll No.....

Annual Examination, 2021

B.C.A. III (Old Course)

B.C.A. -301 (PART-I)

Paper II

(Differential Equation and Fourier Series)

Time : 3 Hours]

[Maximum Marks : 50

Note : Attempt any two parts from each unit. All question carry equal marks.

Unit I

1. (a) Solve :

$$\frac{dy}{dx} = \frac{x+2y-3}{2x+y-3}.$$

(b) Solve the differential equation :

$$\frac{dy}{dx} = e^{x-y} (e^x - e^y).$$

(c) Solve :

$$y^2 \log y = xyp + p^2, \text{ where } p = \frac{dy}{dx}.$$

[2]

Unit II

2. (a) Find the equation of the system of orthogonal trajectories of a family of curves $3xy = x^3 - a^3$.

(b) Solve : $(D^3 + 1)y = (e^x + 1)^2$.

(c) Solve :

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

Unit III

3. (a) Construct a partial differential equation from the relation :

$$z = f(x + iy) + g(x - iy).$$

(b) Find the complete integral of :

$$p^2x + q^2y = z.$$

(c) Solve :

$$z(p^2 + q^2) = x^2 + y^2.$$

Unit IV

4. (a) Obtain the Fourier series for $f(x) = e^{-x}$ in the interval $0 < x < 2\pi$.

(b) Express $f(x) = x$ as a half range cosine series in the range $0 < x < 2$.

(c) Obtain the Fourier series in the interval $(-\pi, \pi)$ for the function $f(x)$, defined by :

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

P.T.O.

GO-99-21

Unit V

5. (a) Solve :

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0,$$

for $0 < x < \pi$, $0 < y < \pi$, $u(x, 0) = x^2$

$$u(x, \pi) = 0, \quad \frac{\partial u}{\partial x}(0, y) = \frac{\partial u}{\partial x}(\pi, y) = 0.$$

- (b) Find the deflection $u(x, t)$ of the vibrating string (length $l = \pi$, ends fixed and $c^2 = 1$) corresponding to zero initial velocity and initial deflection $f(x) = k(\sin x - \sin 2x)$.
- (c) Find the potential in the interior of a sphere of unit radius when the potential surface is $f(\theta) = \cos^2 \theta$.

★ ★ ★ ★ ★ c ★ ★ ★ ★