

## IV Semester B.A./B.Sc. Examination, September/October 2023 (NEP - Freshers) MATHEMATICS (Paper - IV) Partial Differential Equations and Integral Transforms

Time: 21/2 Hours

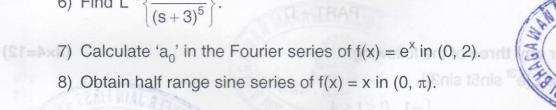
Max. Marks: 60

Instruction : Answer all the Parts.

III. Answer any three of the follow A - TRAP

I. Answer any six of the following.

- 1) Form a partial differential equation by eliminating arbitrary constants from  $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$ .
  - 2) Solve:  $\sqrt{p} + \sqrt{q} = 1$ .
  - 3) Solve:  $[D^2 + 3D D' + 2 (D')^2]z = 0$ .
  - 4) Write the condition for partial differential equation of second order to be elliptic and give an example for elliptic partial differential equation.
  - 5) Find L{sin5t cos3t}.
  - 6) Find L<sup>-1</sup>  $\left\{ \frac{4}{(s+3)^5} \right\}$ .





II. Answer any three of the following.

 $(3 \times 4 = 12)$ 

- 1) Form the partial differential equation by eliminating arbitrary functions from z = f(x + ay) + g(x - ay).
- 2) Solve:  $\left(\frac{y^2z}{x}\right)p + xzq = y^2$ .



- 3) Solve :  $\frac{\partial^3 z}{\partial x^2 \partial y} = \sin(2x + 3y)$  by direct integration method.
- 4) Solve by Charpit's method, pxy + pq + qy yz = 0.
- 5) Solve:  $9(p^2z + q^2) = 4$ .

## PART - Charles seven A is not sourcent.

III. Answer any three of the following.

 $(3 \times 4 = 12)$ 

- 1) Solve :  $r 2s + t = e^{x + 2y}$ .
  - 2) Solve:  $(D^2 DD')z = \cos x \cos 2y$ .
  - 3) Solve:  $(D 3D' 2)^2 z = 2e^{2x} \tan (y + 3x)$ .
  - 4) A tightly stretched string with fixed end points x = 0 and x = l is initially in a position given by  $y = y_0 \sin^3 \left( \frac{\pi X}{I} \right)$ . If it is released from rest from this position, find the displacement y(x, t).
  - 5) Solve  $\frac{\partial u}{\partial t} = 16 \frac{\partial^2 u}{\partial x^2}$  subject to the conditions,
    - i) u(0, t) = 0, u(1, t) = 0,  $\forall t$
  - ii)  $u(x, 0) = x^2 x, 0 \le x \le 1$ . AL RIWAMAN

IV. Answer any three of the following. (3×4=12)

- 1) Find L{ $e^{3t}$  sin5t sin3t}.
  - 2) Find L{f(t)}, if f(t) =  $\begin{cases} -1 & 0 \le t \le 4 \\ 1 & t > 4 \end{cases}$ .
  - 3) Find  $L^{-1}\left\{\frac{1}{(s+1)(s+2)(s+3)}\right\}$ .
    - 4) Find L  $\left\{ \frac{\cos at \cos bt}{t} \right\}$ .
    - 5) Solve by using Laplace transform

$$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}, \ y(0) = 0, \ y'(0) = 0.$$





## PART – E

V. Answer any three of the following.

 $(3 \times 4 = 12)$ 

- 1) Obtain the Fourier series for the function  $f(x) = x x^2$  over the interval  $-\pi \le x \le \pi$ .
- 2) Obtain the Fourier series expansion of the function f(x) defined as  $f(x) = \begin{cases} -k, & -\pi < x < 0 \\ k, & 0 < x < \pi \end{cases}$
- 3) Obtain the half-range cosine Fourier series of  $f(x) = x^2$  in  $0 < x < \pi$ .
- 4) Find the Fourier transform of the function  $f(x) = \begin{cases} x, & |x| \le a \\ 0, & |x| > a \end{cases}$ .
- 5) Find the Fourier sine transform of  $\frac{e^{-ax}}{x}$ , a > 0.

