PRANVEER SINGH INSTITUTE OF TECHNOLOGY KANPUR CT -I

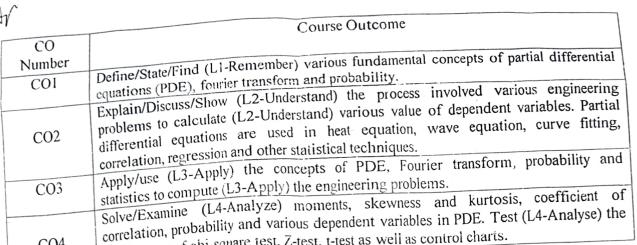
Odd Semester

Session 2023-24

B. Tech. - 3rd Semester

Mathematics-IV (BAS-303)





Time: 1.5 Hrs.

CO4

Section A

significance of chi-square test, Z-test, t-test as well as control charts.

M. M. 20

(1X5 = 5 Marks)

Define partial differential equation by eliminating the arbitrary constant from Q1. Attempt all questions: a)

z = (a + x)(y + b)

Find the singular integral of z = px + qy + pqb)

CO₁

CO1

Find the C.F. of the PDE $(D^2 - D'^2 - 3D + 3D')z = 0$ c)

CO1

Find the classification of the differential equation d)

CO₁

 $t\frac{\partial^2 u}{\partial t^2} + 3\frac{\partial^2 u}{\partial x \partial t} + x\frac{\partial^2 u}{\partial x^2} + 17\frac{\partial u}{\partial t} = 0$

Define non-linear partial differential equation of first order with an example. e)

CO₁

Section B

Q2. Attempt all questions:

(2.5X4 = 10 Marks)

CO4 Solve the PDE $(x^2 - yz) p + (y^2 - zx) q = z^2 - xy$ a i)

CO4 Solve the PDE $(D^2 - 2D'^2)z = sinx cos2y$ ii)

CO₂ Calculate the complete solution of following PDE bi)

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

ii) Calculate the complete solution of the PDE

CO2

$$\frac{\partial^2 z}{\partial x^2} - 3\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = e^{2x+3y} + \sin(x-2y)$$

c i) Use the method of separation of variables to solve the equation

CO3

$$\frac{\partial u}{\partial x} = 4 \frac{\partial u}{\partial y}$$
 ; $u(0, y) = 8 e^{-y}$

Or

Apply the concept of partial differential equation to solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with boundary conditions u(0,t) = 0, u(l,t) = 0 and $u(x,0) = 3 \sin n\pi x$

d i) Use the concept of PDE to solve $(D + 3D' - 2)^2z = 2e^{2x}\tan(y + 3x)$

CO3

Or

ii) Apply the concept of non-linear PDE to solve

 O_3

CO3

$$p + q = sinx + siny$$

Section C

(5X1 = 5 Marks)

- Solve the equation by Charpit's method $x^2p^2 + y^2q^2 = 4CO4$ Or
- ii) A string is stretched and fastened to two points l apart. Motion is started by displacing the CO4 string in the form $y = A \sin \frac{\pi x}{l}$ from which it is released at time t = 0. Examine the concept one dimensional wave equation to show that the displacement of any point at distance x the string from one end at time t is given by

$$y = A \sin \frac{\pi x}{l} \cos \frac{\pi ct}{l}$$