(b) Solve the differential equation

$(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$

(c) Use convolution theorem to evaluate :

$$L^{-1}\frac{P}{\left(P^2+4\right)^2}$$

Q5. Attempt any ***two*** parts of the following : 10x2=20

(a) Solve the differential equation by using Laplace and inverse Laplace transformations.

$$\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 0$$

Where $y = 1, \frac{dy}{dt} = 2, \frac{d^2y}{dt^2} = 2$, at $t = 0$.

(b) Solve the following equation

$(D^2 - 2D + 1)y = x\, e^x \sin x$

(c) Show that the equation $z_{xx} + 2x(z)_{xy} + (1 - y^2)Z_{yy} = 0$ is elliptic for values of x and y in the region $x^2 + y^2 < 1$. Parabolic on the boundary and hyperbolic outside this region.

Printed Pages : 4

NBC201

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 194401

Roll No.

MCA-DUAL DEGREE

(SEM. II) THEORY EXAM. 2014-15

MATHEMATICS-II

Time : 3 Hours] [Total Marks : 100

Note : Attempt the questions as indicated.

Q1. Attempt any ***four*** parts of the following : 5x4=20

(a) Solve the following equation $\sec^2 x.\tan y\, dx + \sec^2 y.\tan x\, dy = 0$

(b) If $L\left(\cos^2 t\right) = \frac{P^2+2}{P\left(P^2+4\right)}$, find L $(\cos^2 at)$

(c) Solve PDE $yzp - xzq = xy$.

(d) Find the value of the following $L^{-1}\dfrac{4P+15}{16P^2-25}$

(e) Solve $(D-2)^3 y = 17\, e^{2x}$

(f) Solve $\dfrac{dy}{dx}=\dfrac{1+y^2}{1+x^2}$

Q2. Attempt any ***two*** parts of the following : 10x2=20

(a) Obtain Fourier series expansion of

$$f(x)=\left(\frac{\pi-x}{2}\right) \text{ for } 0<x<2.$$

(b) Find inverse Laplace transform of

$$\frac{14P+10}{49P^2+28P+13}$$

(c) Solve Linears PDE

$$\frac{\partial^3 u}{\partial x^3}-3\frac{\partial^3 u}{\partial x^2.\partial y}+4\frac{\partial^3 u}{\partial y^3}=e^{x+2y}$$

Q3. Attempt any ***two*** parts of the following : 10x2=20

(a) Solve in series the following differential equation

$$2x(1-x)\frac{d^2y}{dx^2}+(5-7x)\frac{dy}{dx}-3y=0$$

by Frobenius method.

(b) Solve by the method of variation of parameter.

$$\frac{d^2y}{dx^2}+a^2y=\sec ax$$

(c) Find $\int_0^\infty \dfrac{e^{-t}Sin\sqrt{3t}}{t}.\,dt$

Using Laplace transform.

Q4. Attempt any ***two*** parts of the following : 10x2=20

(a) Obtain Fourier series for the function $f(x)=x^2$,

where $-\pi \le x \le \pi$.

Hence show that

$$\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\ldots.=\frac{\pi^2}{6}$$