

# NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belgaum)

II Sem B.E. (Credit System) Mid Semester Examinations – I March 2013

12MA201 – ENGINEERING MATHEMATICS - II

Duration: 1 Hour

Max. Marks: 20

Note: Answer **Five full** questions choosing at least **two** from each Part.

## Part – I

Solve  $(x^2 + y^2)dx = xydy$ .

Solve  $\left(xy^2 - e^{\frac{1}{x^3}}\right)dx - x^2ydy = 0$ .

Solve the differential equation  $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$ .

Find the orthogonal trajectory of the family of curves  $r^2 = a^2 \cos 2\theta$ .

## Part – II

Define (i) linear dependence (ii) linear independence of a set of vectors  $\{u_1, u_2, \dots, u_n\}$ .

Check whether the set  $\{(1, 4, 5); (4, 4, 8); (3, -3, 0)\}$  is linearly dependent.

Define the rank of a matrix. Find the rank of the matrix

$$\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 3 & 3 & -1 \\ 0 & 1 & 1 & -1 \\ 1 & 0 & 1 & 1 \end{bmatrix}$$

by reducing to row echelon form.

Using Gauss-Seidel iteration method solve the system of equations:

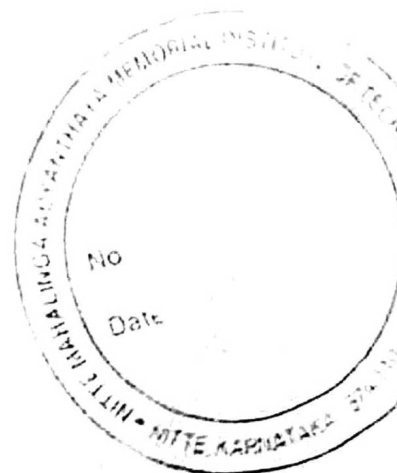
$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25$$

Start with  $X^{(0)} = y^{(0)} = z^{(0)} = 0$  and carryout 3 iterations.

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**Part – I**

Solve the differential equation  $\frac{dy}{dx} = \frac{x+y-1}{x+y+1}$ .

Solve the differential equation  $y(x+y+1)dx + x(x+3y+2)dy = 0$ .

Solve the differential equation  $\tan y \frac{dy}{dx} + \tan x = \cos y \cos^2 x$ .

Find the orthogonal trajectory of the family of curves  $r^n = a^n \sin n\theta$ .

**Part – II**

Define a basis for a vector space. Check whether the set  $\{(1,0,7); (1,2,4); (1,0,3)\}$  is a basis for  $\mathbb{R}^3$ .

Define rank of a matrix. Find the rank of the matrix

$$\begin{bmatrix} 1 & 1 & 1 & 4 \\ 2 & 1 & -1 & 1 \\ 1 & -1 & 2 & 2 \\ 2 & 0 & 3 & 6 \end{bmatrix}$$

by reducing it to row echelon form.

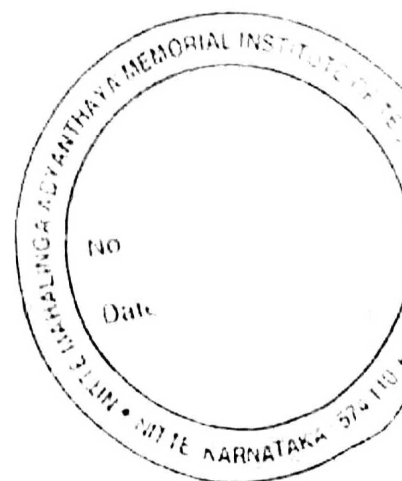
Use Gauss Seidel iteration method to solve

$$5x - 2y + z = 3$$

$$x - 4y - 2z = 5 \quad \text{start with } x^{(0)} = y^{(0)} = z^{(0)} = 0 \text{ and carry out three iterations.}$$

$$4x + y + 6z = -8$$

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# NMAM INSTITUTE OF TECHNOLOGY, NITTE

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II Sem B.E. (Credit System) Mid Semester Examinations – II, April 2013

12MA201 – ENGINEERING MATHEMATICS - II

Duration: 1 Hour

Max. Marks: 20

Note: Answer **Five** full questions choosing **at least two** from **each** Part.

## Part – I

Solve the differential equation  $(4D^2 - 1)y = e^{\frac{x}{2}} + 12e^x + 4$ .

Solve the differential equation  $(D^2 - 4D + 3)y = \sin 3x$ .

Using the method of variation of parameters, solve  $(D^2 + 1)y = \sec x \tan x$ .

Solve the differential equation  $x^2 \frac{d^2 y}{dx^2} + 2x \frac{dy}{dx} - 12y = x^3$ .

## Part – II

Evaluate  $\iint_D xy(x+y) dx dy$  if D is the region bounded by  $y=x^2$  and  $y=x$ .

By changing the order of integration evaluate  $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dy dx$

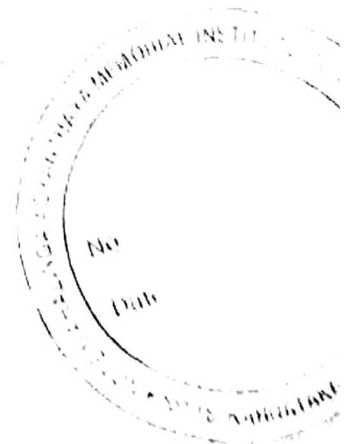
Find the largest eigen value and the corresponding eigen vector of the matrix

$$\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$$

by using power method. Start with the initial vector  $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$  and carry out five

iterations.

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ation: 1 Hour

**Note: Answer Five questions choosing at least two from each Part.**

## Part – I

Solve the differential equation  $(D^2 - 4D + 4)y = e^{2x}$ .

Using the method of variation of parameters solve the differential equation

$$(D^2 - 2D + 1)y = \frac{e^x}{x}.$$

Solve the differential equation  $(D^2 + 2D + 2)y = 1 + 3x + x^2$ .

Solve the differential equation  $x^2 \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} - 4y = x^2 + 2 \log x$ .

## Part – II

Part - II

Evaluate  $\iint_D (x^2 + y^2) dx dy$  if D is the region bounded between  $x = 2, y = 1$  and  $y = x^2$ .

Evaluate  $\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dx dy$  by changing to polar coordinates.

Using Power method find the largest eigen value and the corresponding eigen vector of the matrix

matrix  $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ . Take the initial eigen vector as  $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$  and carry out five iterations.

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