QUESTION -3 If $f(t) = t^2, 0 < t < 2$ and $f($ $f(t)$ for $t > 2$ nd $L[f(t)]$

QUESTION -4 Using Cayley Hamilton theoren e Inverse of the following matrix $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$

QUESTION -5 Evaluate $\int_0^\infty te^{-2t} sint\, dt$

QUESTION -6 Find the value of K such that th of equations $x + ky + 3z = 0, 4x + 3y + kz = 0, 2x + y + 2z = 0$ → has non-trivial solution.

SECTIO

20 marks(Each question is of 10 marks)

QUESTION -7

(a)Find the Eigen values & corresponding Eigen s of the following Matrix

$$\begin{bmatrix} 5 & 8 & 16 \\ 4 & 1 & 8 \\ -4 & -4 & -11 \end{bmatrix}$$

(b)Solve the initial value problem $2\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + = e^{-2t}$ $y(0) = 1, y'(0) = 1$ using the Laplace transform

QUESTION -8

(a)Solve the following differential equation $x(1 -)y'' + 2(1 - 2x)y' - 2y = 0$ using Frobenious method

(b) Using Variation of Parameters method, solve t following differential equation.

$$x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 12y = x^3 log x.$$

$A^3 - 6A^2 + 9A - 4I$

Department Of Mathematics

UNIVERSITY INSTITUTE OF ENGINEERING & TECHOLOGY

C.S.J.M UNIVERSITY KANPUR

MATHS –II (MTHS -102)

BRANCH - ECE

Semester: 2022 -23 (Even Semester) YEAR: 1st

END SEMESTER EXAMINATION

Time: 3.0 hr. Maximum Marks: 50

ALL QUESTIONS ARE COMPULSORY

SECTION –A

10 marks(Each question is of 1mark) 1*10=10

QUESTION -1

(a)Find the rank of the following matrix

$$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

(b)Find the type of the following complex matrix $A = \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$

(c) Solve the following differential equation

$$[D^3 + 6D^2 + 11D + 6]y = 0$$

(d) Solve the following differential equation $\frac{d^2y}{dx^2} + a^2y = sinax$

(e)A matrix A will be called Involuntary if .....

(f)Test whether the following system of equations are consistent or not $2x + 6y = -11, 6x + 20y - 6z = +3, 6y - 18z = -1$

(g)Find the Laplace transform of $t^{-1/2}$

(h) Find the Laplace transform of $\frac{sin2t}{t}$

(i)Write Second shifting theorem

(j) Find the Laplace transform of $t^3\delta(t-4)$

SECTION –B

20 marks (Each question is of 4 marks)

QUESTION -2) Solve the following differential equation $\frac{d^3y}{dx^3} - 3\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 2y = e^x + Cosx$

By the method of Solution by undetermined coefficients.

DEPARTMENT OF ECE ENGINEERING

UNIVERSITY INSTITUTE OF ENGINEERING AND TECHNOLOGY, CSJM UNIVERSITY, KANPUR

Math-II (MTH-S102)

Semester:2022-23(Even Semester). **Year: Ist Year(2K22)**

Mid Semester Examination

Time1.5 h. **Maximum mark: 30**

All questions are compulsory

SECTION – A

QUESTION – 1 1*9=9

(a)The diagonal elements of a skew – Hermitian matrix are .....

(b) A Square matrix A is said to be orthogonal if .....

(c) An idempotent matrix is a periodic matrix with period .....

(d) For which value of x will the matrix $\begin{bmatrix} 8 & x & 0 \\ 4 & 0 & 2 \\ 12 & 6 & 0 \end{bmatrix}$ be come singular?

(e) Rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \end{bmatrix}$ is .....

(f) A system of equation $AX = B$ is homogeneous if .....

(g) The Integrating factor for the differential equation, $y \log y \, dx + (x - \log y) \, dy = 0$ is .....

(h)The solution of the differential equation $sec^2 x \tan y \, dx + sec^2 y \, tanx \, dy = 0$ is .....

(i)The set of all characteristic roots of a square matrix A is called the .....

SECTION – B (3*3= 9)

QUESTION -2

Solve the following differential equation

$$y(xy + 2x^2y^2)dx + x(xy - x^2y^2)dy = 0$$

QUESTION -3

For what value of μ and λ *the equations* $x + 2y + z = 6$

solution does not exist $x + 2y + 3z = 10$

$x + 2y + \lambda z = \mu$

QUESTION -4

Examine the following system of vectors for linear dependence. If dependent, find the relation between them. $X_1 = [3,1,-4]$, X_2=[2,2,−3] , $X_3[0,-4,1]$

SECTION –C (6*2=12)

QUESTION -5

SOlve the following differential equation $\frac{dy}{dx} = \frac{2x-5y+3}{2x+4y-6}$

QUESTION -6

Using Cayley Hamilton Theorem, find A^{-1}, If $A = \begin{bmatrix} 2 & -1 & 3 \\ 1 & 0 & 2 \\ 4 & -2 & 1 \end{bmatrix}$.