Hall Ticket No: | | | | | | | | | | | **Question Paper Code :**

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)

B. Tech II Semester Regular Examinations May - 2016

(Regulations: R15)

ENGINEERING MATHEMATICS-II
(All Branches)

Date: **Time: 3 hours** **Max Marks: 60**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT-I

1. (a) Reduce the following matrix into its normal form and hence find its rank.

$$A=\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}.$$ (6)

(b) Find the values of k for which the system of equations, (3k-8) x+3y+3z = 0, 3x+ (3k-8) y+3z = 0, 3x+3y+ (3k-8) z=0 has a non-trivial solution. (6)

(Or)

2. (a) Use Gauss-Jordan method to find the inverse of the following matrix,

$$A = \begin{bmatrix} 8 & 4 & 3 \\ 2 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix}$$ (6)

(b) Show that the equations, 3x+4y+5z=a, 4x+5y+6z=b, 5x+6y+7z =c do not have a solution unless a + c = 2b i.e. a, b, c are in A.P. (6)

UNIT-II

3. (a) Find Eigen values and Eigen vectors of the matrix, $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$. (6)

(b) Verify Cayley Hamilton theorem for the matrix $A=\begin{bmatrix} 3 & 2 & 4 \\ 4 & 3 & 2 \\ 2 & 4 & 3 \end{bmatrix}$ and hence find its inverse. (6)

(Or)

4. (a). If A $=\begin{pmatrix} 5 & 3 \\ 1 & 3 \end{pmatrix}$, find A^4 by diagonalization. (6)

(b). Reduce the Quadratic form $3x^2+3y^2+3z^2+2xy-2yz+2zx$ to canonical form.

Also specify, the matrix of transformation and nature of the Quadratic form. (6)

UNIT-III

5. (a). Solve, $x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}-4y=x^4$. (6)

(b). Find the orthogonal trajectories of family of the cardioids $r=a(1-\cos\theta)$. (6)

(Or)

6. (a.) Solve ,

$i)\ xy\log(x/y)dx+[y^2-x^2\log(x/y)]dy=0.$ $ii)\ y\sin 2x dx-\left(1+y^2+\cos^2 x\right)dy=0$ (6)

(b). Show that, the differential equation for the current i in an electrical circuit containing an inductance L and a resistance R in series and acted on by an electromotive force E sin(ωt) satisfies the equation L di/dt + Ri = E sin(ωt). Find the value of the current at any time t, if initially there is no current in the circuit. (6)

UNIT-IV

7. (a). Solve, $(D^2-4D+4)y=8x^2e^{2x}\sin 2x$. (6)

(b). Solve, $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}+y=\log x$. (6)

(Or)

8. (a). Solve, $\frac{d^2y}{dx^2}+\frac{dy}{dx}=x^2+2x+4$. (6)

(b).Solve by the method of variation of parameters, $y^{11}-6y^1+9y=e^{3x}/x^2$. (6)

UNIT-V

9. (a). Find the Laplace Transform of the following,

i) $e^{-t}\sin^2 t$ ii) $\frac{\sin at}{t}$. (3+3)

(b). Apply convolution theorem to evaluate $L^{-1}\left\{\frac{1}{s(s^2+1)}\right\}$. (6)

(or)

10. (a) (i) Find the Laplace transform of the full-wave rectifier f(t) = E Sin wt , $0<t<\pi/w$. (3)

(ii)Find the Inverse Laplace Transform of $\log\left(\frac{1+s}{s}\right)$. (3)

(b) Solve by the method of transforms, the equation, $y^{11}+4y^1+3y=e^{-t}, y(0)=y^1(0)=1$. (6)

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Date: **Time: 3 hours** **Max Marks: 60**

Answer ONE Question from each Unit
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UNIT-I

1. (a)Reduce the following matrix into its PAQ form and hence find its rank. (6)

$$A=\begin{bmatrix} 1 & 2 & -1 & 4 \\ 2 & 4 & 3 & 4 \\ 1 & 2 & 3 & 4 \\ -1 & -2 & 6 & -7 \end{bmatrix}.$$

(b) Test for consistency the following equations and solve them if consistent: (6)

x - 2y +3t =2, 2x+ y + z + t = -4, 4x-3y+ z +7t = 8.

(Or)

2. (a) Use Gauss-Jordan method to find the inverse of the following matrix, (6)

$$A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}.$$

(b) Investigate for what values of λ and μ the simultaneous equations (6)

x + y + z = 6, x+2y +3z = 10, x + 2y + λ z = μ have (i) no solution (ii) a unique solution (iii) infinitely many solutions.

UNIT-II

3 (a) Find Eigen values and Eigen vectors of the matrix, $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. (6)

(b) (i) Prove that the sum of Eigen values of a matrix is its trace. (3)

(ii) Find the characteristic equation of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ and hence

compute A^{-1} (3)

(or)

4 (a) Find the matrix P which transforms the matrix A = $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ to the diagonal form.

Hence calculate A^4. (6)

(b) Find the Rank, Index and Signature of the quadratic form
$x^2+5y^2+z^2+2yz+6zx+2xy$ (6)

UNIT-III

5 (a) Solve, $(xy^2-e^{1/x^3})dx-x^2ydy=0$. (6)

(b) If the temperature of the air is 30^0c and the substance cools from 100^0c to 70^0c in 15 min. Find when the temperature will be 40^0c . (6)

(Or)

6 (a) Solve , $xy(1+xy^2)\frac{dy}{dx}=1$ (6)

(b) Find the orthogonal trajectories of the family of confocal conics , $\frac{x^2}{a^2}+\frac{y^2}{a^2+\lambda}=1$ where λ is a parameter. (6)

UNIT-IV

7 (a) Solve, $(D^2+2D+1)y=x\cos x$. (6)

(b) Solve, $i).\ \frac{d^2y}{dx^2}+4y=\tan 2x$

$ii).(1+x)^2\frac{d^2y}{dx^2}+(1+x)\frac{dy}{dx}+y=2\sin(\log(1+x))$. (3+3)

(Or)

8 (a) Solve, $(D^2+4D+3)y=e^{-x}\sin x+xe^{3x}$. (6)

(b)Solve by the method of variation of parameters $\frac{d^2y}{dx^2}+4y=\tan 2x$. (6)

UNIT-V

9. (a) Find the Laplace Transform of $f(t)$ defined as $f(t) = \begin{cases} \dfrac{t}{\tau}, & when\, 0 < t < \tau \\ 1, & when\, t > \tau \end{cases}$ (6)

(b) Use transform method to solve $\dfrac{d^2x}{dt^2} - 2\dfrac{dx}{dt} + x = e^t$ with $x = 2,\ \dfrac{dx}{dt} = -1$ at $t = o$. (6)

(or)

10. (a) Find the Inverse Laplace Transform of $\log\left(\dfrac{1+s}{s}\right)$. (6)

(b) Evaluate $L\left\{t\int_0^t \dfrac{e^{-t}\sin t}{t}\,dt\right\}$. (6)