

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to JNTUA, Ananthapuramu)

I B.Tech II Semester (SVEC-19) Regular Examinations December - 2020**TRANSFORMATION TECHNIQUES AND LINEAR ALGEBRA**

[Civil Engineering, Electrical and Electronics Engineering, Mechanical Engineering,
Electronics and Communication Engineering, Computer Science and Engineering,
Electronics and Instrumentation Engineering, Information Technology,
Computer Science and Systems Engineering]

Time: 3 hours

Max. Marks: 60

Answer One Question from each Unit
All questions carry equal marks

UNIT-I

1. a) Obtain the Fourier series for x^2 in the interval $-\pi < x < \pi$. 8 Marks L3 CO1 PO2
Hence show that $1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \frac{1}{5^2} \dots = \frac{\pi^2}{12}$
- b) 1. Find the Fourier transform of $f(x) = \begin{cases} 1 & \text{for } |x| < a \\ 0 & \text{for } |x| > a \end{cases}$ 4 Marks L2 CO1 PO1
- (OR)
2. a) Find the half-range Cosine series for the following function: 6 Marks L2 CO1 PO1
2. $f(x) = 2x - 1$ for $0 < x < 1$.
- b) Obtain Fourier cosine transform of $f(x) = \begin{cases} 2x & ; 0 < x < 1 \\ 2 - x & ; 1 < x < 2 \\ 0 & ; x > 2. \end{cases}$ 6 Marks L2 CO1 PO1

UNIT-II

3. a) Find the Laplace transform of $t \sin at$. 6 Marks L1 CO1 PO1
b) Using Laplace transform, evaluate the integral 6 Marks L3 CO1 PO2
$$\int_0^{\infty} \frac{\sin 2t}{t} dt$$
- (OR)
4. a) 1. Determine Laplace transform of $\int_0^t t^2 \sin t \, dt$. 6 Marks L2 CO1 PO1
b) Find the Laplace transform of 6 Marks L2 CO1 PO1
$$f(t) = \begin{cases} 0, & 0 < t < 1 \\ 1, & 1 < t < 2 \\ 2, & t > 2 \end{cases}$$

UNIT-III

5. a) Solve the following differential equation using Laplace transform 8 Marks L3 CO1 PO2
 $y'' + 2y' + 2y = 5 \sin t$, $y(0) = y'(0) = 0$.
- b) Find $L^{-1} \left[\frac{2s + 3}{s^2 - 4s + 13} \right]$. 4 Marks L2 CO1 PO1

(OR)

6. a) Find $L^{-1}\left[\frac{s-3}{s^2+4s+13}\right]$. 6 Marks L2 CO1 PO1
- b) Apply convolution theorem to find $L^{-1}\left[\frac{1}{s(s^2+4)}\right]$. 6 Marks L3 CO1 PO2

UNIT-IV

7. Verify that the only real value λ for which the following equations have nontrivial solution is 6 and solve them when $\lambda = 6$. 12 Marks L3 CO2 PO2
- b) $x+2y+3z=\lambda x$
- c) $3x+y+2z=\lambda y$
- d) $2x+3y+z=\lambda z$

(OR)

8. a) Find the eigenvalues and the corresponding eigen vectors of the matrix $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$. 8 Marks L3 CO2 PO2

- b) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$. 4 Marks L1 CO2 PO1

UNIT-V

9. a) Determine whether the vectors $\begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$ and $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$ are linearly independent. 4 Marks L2 CO2 PO1
- b) Determine the rank and nullity of the linear transformation $T: P_3 \rightarrow R^2$ defined by $T(a+bx+cx^2+dx^3) = \begin{bmatrix} a+2b+c+2d \\ 3a+4b-c-2d \end{bmatrix}$. 8 Marks L3 CO2 PO2

(OR)

10. a) 2. Show that the vectors $\{(1,1,2), (1,2,5), (5,3,4)\}$ do not form a basis for $R^3(R)$. 4 Marks L2 CO2 PO1
- b) Let $T: P_2 \rightarrow P_2$ be the linear transformation defined by $T(p(x)) = p(2x-1)$. Find the matrix of T with respect to the basis $\{1, x, x^2\}$. 8 Marks L3 CO2 PO2

