



R22 Regulation

Subject code:4B2AF

**TKR COLLEGE OF ENGINEERING AND TECHNOLOGY**

(Autonomous, Accredited by NAAC with 'A+' Grade)

**B.Tech II Semester Regular/Supplementary Examinations, July 2025**  
**MATHEMATICAL TRANSFORMS**

(Common to EEE & ECE)

Maximum Marks: 60

Date: 09.07.2025

Duration: 3 hours

- Note: 1.This question paper contains two parts A and B.  
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.  
 3. Part B consists of 5 Units. Answer any one full question from each unit.  
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	BTL
1.a	Find $L\left\{\frac{\sin t}{t}\right\}$ .	1M	CO1	BTL 1
b	Find $L\{2 \cos 5t - 3 \sin 3t\}$ .	1M	CO2	BTL2
c	Find $\mathcal{L}^{-1}\{(2s+3)/(s^2+2s+5)\}$	1M	CO1	BTL1
d	State the first shifting property of Inverse Laplace Transform.	1M	CO3	BTL-2
e	Write the Dirichlet conditions for the expansion of a function as a Fourier series in the interval $c_1 \leq x \leq c_2$	1M	CO4	
f	Find the value of $b_n$ in the Fourier series of $f(x)= x $ in $(-\pi, \pi)$	1M	O2	BTL-3
g	If Fourier transform of $f(x) = F(S)$ , then find the Fourier transform of $f(2x)$	1M	CO3	BTL-1
h	If $f(x) = \begin{cases} 1, & 0 \leq x \leq \pi \\ 0, & x > \pi \end{cases}$ , Then find the Fourier sine integral of $f(x)$	1M	CO2	BTL-2
i	Write the initial value theorem on z-transform	1M	CO3	BTL-2
j	Find $Z^{-1}\left[\frac{Z^2 - 2z}{(Z-1)^2}\right]$	1M	CO3	BTL-3

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	a) Evaluate $\int_0^\infty \frac{\cos at - \cos bt}{t} dt$ , using Laplace Transforms b) Find $L\{\int_0^t te^{-t} \sin 4t dt\}$ .	5M 5M	CO2	BTL-4
OR				
3	a) Find the Laplace transform of $t e^{-3t} \cos 2t$ . b) Prove that $\int_0^\infty \frac{e^{-at} - e^{-bt}}{t} dt = \log \frac{b}{a}$ by using Laplace transformation.	5M 5M	CO4	BTL-3

4	<p>a) Find the inverse Laplace transform of <math>\frac{2s^2 - 6s + 5}{s^3 - 6s^2 + 11s - 6}</math>.</p> <p>b) Using Convolution theorem, Find <math>L^{-1} \left\{ \frac{s^2}{(s^2 + a^2)(s^2 + b^2)} \right\}</math>.</p>	5M	CO3	BTL-3
OR				
5	<p>Using Laplace Transforms, Solve the DE <math>\frac{d^2x}{dt^2} - 2\frac{dx}{dt} + x = e^t</math> with <math>x = 2, \frac{dx}{dt} = -1</math> when <math>t = 0</math>.</p>	10M	CO4	BTL-4
6	<p>Obtain Fourier series for the function <math>f(x) = \begin{cases} \pi x, &amp; 0 \leq x \leq 1 \\ \pi(2-x), &amp; 1 \leq x \leq 2 \end{cases}</math></p> <p>Deduce that <math>\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots + \infty = \frac{\pi^2}{8}</math></p>	10M	CO3	BTL-3
OR				
7	<p>If <math>f(x) =  \cos x </math>, expand <math>f(x)</math> as a Fourier series in the interval <math>(-\pi, \pi)</math></p>	10M	CO4	BTL-4
8	<p>a) Find the Fourier sine and cosine transform of <math>x^{n-1}, n &gt; 0</math></p> <p>b) Find the Fourier transform of <math>f(x) = \begin{cases} 1, &amp;  x  &lt; a \\ 0, &amp;  x  &gt; a \end{cases}</math></p>	5M 5M	CO3	BTL-3
OR				
9	<p>a) Find the Fourier Sine transform of <math>\left(1 - \frac{x}{\pi}\right)^2</math></p> <p>b) Find the finite Fourier sine and cosine transform of <math>f(x) = 2x, 0 &lt; x &lt; 4</math></p>	5M 5M	CO4	BTL-3
10	<p>a) Find the Z-transform of <math>\cos\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)</math></p> <p>b) Find the inverse Z-transform of <math>\frac{2z}{(z-1)(z^2+1)}</math></p>	5M 5M	CO3	BTL-4
OR				
11	<p>Solve <math>y_{n+2} + 6y_{n+1} + 9y_n = 2^n</math> with <math>y_0 = y_1 = 0</math>, using Z-transforms</p>	10M	CO4	BTL-4