



R22 Regulation

Subject code:4B2AF

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Supplementary Examinations, January 2026

MATHEMATICAL TRANSFORMS

(Common to EEE & ECE)

Maximum Marks: 60

Date: 08.01.2026

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 only one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

Table with 5 columns: Question ID, Question Text, Marks, CO, BTL. Contains 10 rows of questions (I.a to j) related to Laplace, Fourier, and Z-transforms.

Part-B

Table with 5 columns: Question ID, Question Text, Marks, CO, BTL. Contains 2 rows of questions (2 and OR) related to Laplace Transform of a periodic function.

3	a) Find Laplace transform of $\frac{1-e^t}{t}$ b) Evaluate $L\{te^{2t} \sin 2t\}$	5M	CO3	BTL-3
4	a) Find the inverse Laplace transform using convolution theorem: $L^{-1}\left(\frac{1}{s^2(s+1)}\right)$ . b) Find $L^{-1}\left(\frac{3s+2}{(s^2+2s+10)(s-2)}\right)$	5M 5M	CO4	BTL-3
OR				
5	Using Laplace transform, solve: $y'' + 4y = \sin(2t)$ , with $y(0) = 0, y'(0) = 1$ .	10M	CO3	BTL-4
6	Find the Fourier series expansion of $f(x) = 2x - x^2$ in $(0, 3)$ and hence deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots - \infty = \frac{\pi}{12}$	10M		BTL-3
OR				
7	Obtain a half range cosine series for $f(x) = \begin{cases} kx, & 0 \leq x \leq l/2 \\ k(l-x), & l/2 \leq x \leq l \end{cases}$ Deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots + \infty = \frac{\pi^2}{8}$	10M	CO3	BTL-4
8	a) Find the Fourier sine transform of $e^{- x }$ , Hence show that $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx = \frac{\pi e^{-m}}{2}$ b) Find the Fourier cosine transform of $e^{-x^2}$	5M 5M	CO4	BTL-3
OR				
9	a) Find the Fourier transform of $f(x) = \begin{cases} a^2 - x^2 & \text{for }  x  \leq a \\ 0 &  x  > a \end{cases}$ b) Find the Fourier integral representation for $f(x) = \begin{cases} e^{ax} & \text{for } x \leq 0, a > 0 \\ e^{-ax} & \text{for } x \geq 0, a < 0 \end{cases}$	5M 5M	CO3	BTL-3
10	a) Find the Z-transform of $n^2 e^{n\theta}$ b) Find the inverse Z-transform of $\frac{2(z^2 - 5z + 6)}{(z-2)(z-3)^2}$ for $2 < z < 3$	5M 5M	CO2	BTL-4
OR				
11	Using the Z-transform solve $u_{n+2} + 4u_{n+1} + 3u_n = 3^n$ with $u_0 = 0, u_1 = 1$	10M	CO4	BTL-4