



R22 Regulation

Subject code:4B2AF

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

## B.Tech II Semester Regular Examinations, September 2023

### MATHEMATICAL TRANSFORMS

(Common to EEE & ECE)

Maximum Marks: 60

Date:14.09.2023 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
  2. Part A is compulsory which carries 10 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)

1. a State first shifting theorem in Laplace Transforms.  
b Find  $L(te^{3t})$   
c State change of scale property in Inverse Laplace Transforms.  
d Find  $L^{-1}\left(\frac{1}{s-a}\right)$   
e Define periodic function.  
f Define Even and odd functions.  
g Find the finite Fourier cosine transform of  $f(x) = 1$  in  $(0,1)$   
h Find the Fourier sine transform of  $e^{-x}$ .  
i  $Z(n) = \underline{\hspace{2cm}}$   
j State convolution theorem.

#### Part-B

Answer All the following questions.

(5X10M=50Marks)

- 2 a) State and prove second shifting theorem in Laplace Transforms. [5]  
b) Find Laplace transform of  $3\cos 4(t-2) \cdot u(t-2)$ , where  $u(t-2)$  represents unit step function. [5]  
OR
- 3 Find the Laplace transform of  $te^{-3t} \cos 4t$ . [10]
- 4 Using convolution theorem, find  $L^{-1}\left(\frac{s^2}{(s^2+a^2)((s^2+b^2))}\right)$ . [10]  
OR
- 5 Solve  $\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = 4t + e^{3t}$ , given that  $y(0) = 1$  and  $y'(0) = 1$ , using Laplace Transforms. [10]
- 6 Obtain the Fourier series for the function  $f(x) = e^x$  from  $x=0$  to  $x=2\pi$  [10]  
OR
- 7 Obtain half range Fourier Sine series for the function  $f(x) = x(\pi - x)$ ;  $0 < x < \pi$  [10]

- 8 Find the finite Fourier sine and cosine transform of  $f(x) = \sin ax$  in  $(0, \pi)$  [10]
- OR
- 9 State and prove change of scale property and shifting properties of Fourier transforms. [10]
- 10 Find  $Z(a^n \cos n\theta)$  and  $Z(a^n \sin \theta)$  [10]
- OR
- 11 Using Z-transform, find the response of the system  $u_{n+2} - 3u_{n+1} - 10u_n = 0$  given  $u_0 = 1$  and  $u_1 = 0$ . [10]