



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject code: 3B2AL

B.Tech II Semester Supplementary Examinations, September 2023

TRANSFORMS THEORY

(ECE)

Maximum Marks: 70

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 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

(10x2M=20 Marks)

- 1 State first shifting theorem of Laplace Transforms
- 2 Define Laplace transform of periodic function.
- 3 State convolution theorem
- 4 State second shifting theorem in inverse Laplace transforms
- 5 Write the Fourier Series for the function $f(x)$ in the interval $(0, 2\pi)$.
- 6 If $f(x) = x \cos x$, in $(-\pi, \pi)$ then find a_1
- 7 If $F(f(x)) = F(s)$ then prove that $F(f(ax)) = \frac{1}{a} F\left(\frac{s}{a}\right)$
- 8 Find $F_c(2e^{-5x} + 5e^{-2x})$.
- 9 Find $z(a^n + b^n)$
- 10 Find the z-transform of $\frac{1}{(n+1)!}$

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 Evaluate $L\left\{\int_0^t te^{-t} \sin 4t dt\right\}$ [10]

OR

- 12 State and prove first shifting theorem in Laplace transforms. [10]

- 13 Find $L^{-1}\left[\frac{1}{s^2(s^2+1)(s^2+4)}\right]$ [10]

OR

- 14 Solve the D.E $\frac{d^2 x}{dt^2} - 4 \frac{dx}{dt} - 12x = e^{3t}$ given that $x(0) = 1$, and $x'(0) = -2$ by using Laplace Transform. [10]

- 15 Express $f(x) = x^2$ as a Fourier series in $[-1, 1]$ [10]

OR

16 Obtain the half range Fourier Cosine series for $f(x) = x \sin x$ in $(0, \pi)$ [10]

17 Find the Fourier sine transform of $f(x) = x$, for $0 < x < 1$ [10]

$$= 2-x, \text{ for } 1 < x < 2$$

$$= 0, \text{ for } x > 2$$

OR

18 Show that Fourier transform of $e^{-\frac{x^2}{2}}$ is its reciprocal. [10]

19 Find $z^{-1}\left(\frac{z^2+z}{(z-1)^2}\right)$ [10]

OR

20 Find $z^{-1}\left[\frac{z^3-20z}{(z-2)^3(z-4)}\right]$ [10]