*R22 Regulation* *Subject code:4E3DE*

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

## B.Tech III Semester Supplementary Examinations, June 2026

## SIGNALS AND SYSTEMS

*(ECE)*

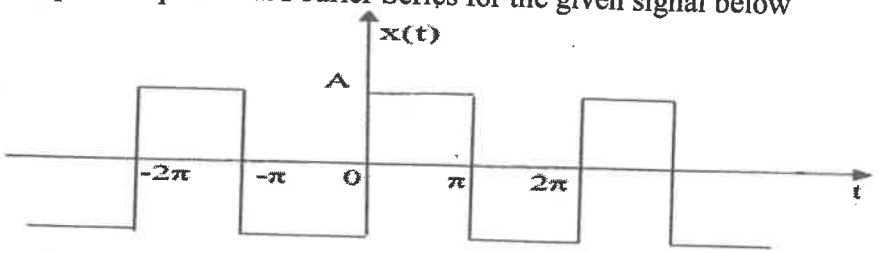
***Maximum Marks: 60*** Date:20.06.2026 Duration: 3 hours

**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) | | Marks | CO | BTL |
|---|---|---|---|---|
| 1.a) | What is the mathematical representation of signum function? | 1M | 1 | L1 |
| b) | What is mean orthogonal signal space? | 1M | 1 | L1 |
| c) | Find Hilbert transform of Sin(wt) and Cos(wt) ? | 1M | 2 | L1 |
| d) | Difference between Fourier series and Fourier transform? | 1M | 2 | L2 |
| e) | What is mean under sampling? | 1M | 3 | L1 |
| f) | What is relation between Laplace transform and Fourier transform? | 1M | 3 | L1 |
| g) | What is the convolution of x(t) and h(t) ? | 1M | 4 | L1 |
| h) | What is mean Parseval's Theorem? | 1M | 4 | L1 |
| i) | What is mean LTI System? | 1M | 5 | L1 |
| j) | What is the condition for distortion less transmission system? | 1M | 5 | L1 |

**Part-B**

| Answer All the following questions. (5X10M=50Marks) | | Marks | CO | BTL |
|---|---|---|---|---|
| 2 | a) Define various elementary signals in continuous time and indicate them Graphically<br>b) Sketch the following signals<br>(i) x(t)=2 u(t+2)- 2 u(t-3) (ii)) x(t)=r(t)-r(t-1) (iii) x(t)=π(t-2) | 5M<br>5M | 1 | L2<br>L2 |
| | OR | | | |
| 3 | Test the orthogonality between the two continuous-time signals cos(2t) and sin(2t) over the interval [0,π] ? | 10M | 1 | L3 |
| 4 | Develop the Exponential Fourier Series for the given signal below   | 10M | 2 | L3 |

| | | | | |
|---|---|---|---|---|
| | OR | | | |
| 5 | (a) Find the Fourier transform of the following<br>(i) x(t)=sgn(t) (ii) x(t)=u(t)<br>(b) Discuss about Dirichlet's Conditions. | 5M<br><br>5M | 2 | L2<br><br>L2 |
| 6 | a) Determine the Laplace transform of the following signal<br>$x(t)=\cos(w_0 t)$<br>b) State and prove the convolution property of Laplace transform | 5M<br><br>5M | 3 | L3<br><br>L2 |
| | OR | | | |
| 7 | State and prove the sampling theorem for the band-limited signals with the help of graphical representation? | 10M | 3 | L3 |
| 8 | Obtain the convolution of the following two signals:<br>$x(t)=e^{2t}u(-t)$ & $h(t)=u(t-3)$ | 10M | 4 | L3 |
| | OR | | | |
| 9 | a) Determine the autocorrelation function of $x(t)=e^{-at}u(t)$ ?<br>b) Explain how the periodic signal can be detected in presence of noise by correlation ? | 5M<br>5M | 4 | L3<br>L2 |
| 10 | Derive the relation between bandwidth and risetime? | 10M | 5 | L3 |
| | OR | | | |
| 11 | Write a short note on<br>(i)State space analysis (ii) State model (iii) State transition matrix | 10M | 5 | L2 |