**Code No.PC302EC**

**METHODIST COLLEGE OF ENGINEERING & TECHNOLOGY (An Autonomous Institution)**

**B.E. (ECE) III-Semester (AICTE) (Regular) Examination, Feb -2023**

**Subject: SIGNALS AND SYSTEMS**

**Time: 3 hours Max.Marks:60**

**Note: Missing data, if any, maybe suitably assumed.**

**PART-A**

**Answer all the questions.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q.No.** | **Questions** | **Marks** | **CO** | **BTL** |
| **1. a**  | **Sketch the addition of two signals x(t) and y(t) shown below.** | **2** | **1** | **L2** |
| **b** | **Find the even and odd components of the signal x(t)=cost+sint+cost.sint** | **2** | **1** | **L2** |
| **c** | **Define Trigonometric Fourier series.** | **2** | **2** | **L1** |
| **d** | **State Dirichlet conditions for the existence of Fourier series?** | **2** | **2** | **L1** |
| **e** | **Find the Fourier transform of impulse function.** | **2** | **3** | **L2** |
| **f** | **Define Correlation and what are its types?** | **2** | **3** | **L1** |
| **g** | **What are the properties of linear convolution for continuous tine signals.** | **2** | **4** | **L2** |
| **h** | **Determine whether the system y(n)=**$x^{2}(n-2)$ **is causal or non-causal system?** | **2** | **4** | **L2** |
| **i** | **Find the Z-transform and ROC of the unit step function?** | **2** | **5** | **L2** |
| **j** | What are the properties of ROC of Z-Transform? | **2** | **5** | **L1** |

**PTO**

**PART-B**

**Answer Any Five questions**.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q.No.** |  | **Questions** | **Marks** | **CO** | **BTL** |
| **2.** | **a** | **Identify for the systems described by the following equations, with the input *x(t)* and output *y(t)*, determine which of the systems are linear and which are nonlinear & the systems are time-invariant parameter systems and which are time-varying-parameter systems.**  **and y(t) = t2x(t)**  | **4** | **1** | **L2** |
| **b** | **Explain about the classification of continuous time systems?** | **4** | **1** | **L1** |
| **3.** | **a** | **Show that the signal** $x\_{1}$**(t)=2 and** $x\_{2}$**(t)=**$√3$**(1-2t) are orthogonal over an interval [0,1]?** | **3** | **2** | **L2** |
| **b** | **Find the Exponential Fourier series of the periodic function shown in below figure?** | **5** | **2** | **L3** |
| **4.** | **a** | **Find the Laplace transform and ROC of the signal x(t)=**$e^{-3t}$**.u(t)+**$e^{-2t}$**.u(t)** | **4** | **3** | **L3** |
| **b** | **Find the inverse Laplace transform of the signal X(s)=**$\frac{s}{(s-b)^{2}+a^{2}}$ | **4** | **3** | **L3** |
| **5.** | **a** | **Find linear convolution of x(n) = {1, 2, 3, 1} and h(n) = {1, 1, 1} using graphical method.** | **6** | **4** | **L2** |
| **b** | **Define sampling theorem.** | **2** | **4** | **L1** |
| **6.** | **a** | **State & prove the Z-Transform properties.**  **a) Time Reversal property b) Differentiation in Z-domain property** | **4** | **5** | **L2** |
| **b** | **Find the inverse Z-Transform of the signal X(z)=** $\frac{3z^{-1}}{\left[1-z^{-1}\right][1-2z^{-1}]}$ **by using partial fractions method, if** 1. **ROC:** $\left|Z\right|>2$
2. **ROC:** $\left|Z\right|<1$
3. **ROC:** $1<\left|Z\right|<2$
 | **4** | **5** | **L3** |
|  |  |  |  |  |  |
| **7.** | **a** | **Find the Energy and Power of the signal x(t)=e-j2πt** | **4** | **1** | **L2** |
| **b** | **What is the relationship between exponential and trigonometric Fourier series representation?** | **4** | **2** | **L1** |
| **8.** | **a** | **Find the inverse Fourier transform of the function X(w)=**$\frac{jw}{(2+jw)^{2}}$ | **3** | **3** | **L3** |
| **b** | **Find the DFT of a sequence x[n]=[1,0,-1,0]** | **5** | **4** | **L2** |
| **9.** | **a** | **Find the Z-transform and ROC of the signal x(n)={2,1,-3,0,4}**  | **4** | **5** | **L2** |
| **b** | **Write short notes on operations on continuous time signals.** | **4** | **1** | **L2** |

**\*\*\*\*\*\***