DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary Winter-2023

Course: B. Tech **Semester :IV**

Branch : Electronics Engineering/Electronics and Communication Engineering/Electronics and Tele-communication Engineering

Subject Code & Name: Signals and Systems (BTEXC402/BTETC402)

Max Marks: 60 **Date: 18/01/2024** **Duration: 3 Hr.**

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	Show that i) the convolution of an odd and even function is odd. ii) the convolution of an even and even function is even. iii) the convolution of an odd and odd function is odd.	**CO 01**	**6**
B)	Find even and odd part of (i) $y[n] = u[n] - u[n-4]$ (ii) x(t) = cos(t) + sin(t) + sin(t) cos(t)	**CO 01,02**	**6**
C)	Demonstrate that Energy in continuous domain and fourier domain remains unchanged.	**CO 2**	**6**
Q.2	**Solve Any Two of the following.**		**12**
A)	Find the Fourier series for $f(x)=x^3(-\pi,\pi)$	**CO 03,04**	**6**
B)	Derive the formula for the convolution integral between two signals in the time domain.	**CO 02**	**6**
C)	Determine whether the given signals exhibit periodicity, and if they are periodic, identify their respective periods. i) x(t) = cos(4t) + 2sin(8t) ii) x(t) = cos(3 πt) + 2cos(4 π t)	**CO 03**	**6**
Q. 3	**Solve Any Two of the following.**		**12**
A)	Find the Fourier transform of each of the following signal and sketch the magnitude and phase spectrum for e^{at} u(-t).	**CO 03,04**	**6**
B)	Consider the following LTI System with impulse response $h(n) = \alpha^n u[n]$ with $\lvert\alpha\rvert < 1$ and suppose that the input to this system is $x[n] = \beta^n u[n]$ with $\lvert\beta\rvert < 1$. Find the output $y(n)$ of this system.	**CO 03,04**	**6**

C) Let $g[n] = u[n+3] - u[n-5]$, **CO 03,04** **6**

(i) What is sum of all the values of $g[n]$?

(ii) If $h[n] = g[3n]$, what is sum of all the values of $h[n]$?

Q.4 **Solve Any Two of the following.** **12**

A) Determine the Laplace transform of causal signal as shown in figure x(t) = e^{at} u(t) and depict the ROC **CO 03,04** **6**

B) For given F(s) find f(t) F(s) = 4(s+2) / (s+1)(s+4)(s+10) **CO 03,04** **6**

C) Determine the Z- transform and ROC for the following time signals **CO 02** **6**

i) $x[n] = (2)^n u(n)$ ii) $x[n] = \cos(\omega_0)u(n)$

Q. 5 **Solve Any Two of the following.** **12**

A) Explain Convolution. Also Perform the following convolution, **CO 03,04** **6**

x[n] = u[n], and v[n] = 2. $(0.8)^n$. u[n]

B) Let $x(n)$ be a finite-length sequence given by x(n)= {1,2,4,0,1,-2,2} (here x(0)=0)with discrete time Fourier transform $X(e^{jw})$. Evaluate the following functions of $X(e^{jw})$ without computing the transform itself: **CO 02** **6**

(i) $X(e^{j0})$ (ii) $X(e^{j\pi})$ (iii) $\int_{-\pi}^{\pi} X(e^{jw})\,dw$ (iv) $|X(e^{jw})|$

C) A discrete-time signal x[n] ={1,2,3,4,5}and X[0]=2 , Sketch and carefully label each of the following signals: **CO 04** **6**

i) x[3n-1]

ii) x[-n+1]

iii) x[2n+1]

***** End *****