

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE
End Semester Examination –Supplementary Winter 2023
Course: B. Tech. Class: SY Semester : IV
Branch: Electrical Engineering / Electrical Engineering (Electronics and Power)/ Electrical & Electronics Engg. / Electrical & Power Engineering.

Subject Code & Name: Signals And Systems [BTEEPE405B]

Max Marks: 60

Date: 25/01/2024

Duration: 03:00 Hrs.

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) Explain in detail Linear and non-linear system	Remember	6
B) Define following terms a) unit step, b) Unit ramp c) Unit Impulse	Understand	6
C) Check for the periodicity of following signals and find the fundamental time period if they are periodic: (i) $x[n] = e^{j2\pi n+2}$ (ii) $x(t) = 2 + \sin(2t) + \cos(3\pi t)$ (iii) $x(t) = 2u[n] + \sin[3\pi n]$	Understand	6
Q.2 Solve Any Two of the following.		12
A) What is the Relationship between Laplace Transform and Fourier Transform with example?	Understand	6
B) Explain in detail properties of Fourier Transform	Understand	6
C) Explain in detail properties of LTI system	Remember	6
Q.3 Solve Any Two of the following.		12
A) Consider an LTI system with input and output related through the equation $y(t) = \int_{-\infty}^t e^{-(t-\tau)} x(\tau - 2) d\tau.$ What is the impulse response $h(t)$ for this system?	Evaluate	6
B) Check the following systems for Static/Dynamic/Causal/Non-Causal/Time Variant/Time Invariant	Evaluate	6

$$(i) y(t) = Kx(t^2) + Mx(2t) + \int_{-\infty}^t x(k)dk$$

$$(ii) y(t) = \text{Even}[x(t)] + |x(t)| + \sqrt{x(t)}$$

- C) Calculate the convolution of $x(t) = t^2 + 4t + 3$ and $y(t) = t^2 + 5t + 2$ Evaluate continues signal 6

Q.4 Solve Any Two of the following. 12

- A) State and prove time shifting property of discrete-time Fourier Transform. Remember 6
- B) Explain in detail sampling of the signal Understand 6
- C) State and prove the following properties of z-transform. Understand 6
- i) Time shifting
 - ii) Time reversal
 - iii) Differentiation
 - iv) Scaling in z-domain

Q. 5 Solve Any Two of the following. 12

- A) Explain convolution sum in detail Evaluate 6
- B) Calculate the Discrete Fourier Transform of the sequence $x(n) = \{1, 1, 0, 0\}$ Understand 6
- C) Consider a system whose input $x[n]$ and output $y[n]$ are related by Evaluate 6
- $$y[n - 1] + 2y[n] = x[n].$$
- a) Determine the zero-input response of this system if $y[-1] = 2$.
 - b) Determine the zero-state response of the system to the input $x[n] = (1/4)^n u[n]$.

*** End ***