

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SIXTH SEMESTER B.TECH DEGREE EXAMINATION (S), AUGUST 2023

ROBOTICS AND AUTOMATION

(2020 SCHEME)

Course Code : 20RBT306

Course Name: Signals and Systems

Max. Marks : 100

Duration: 3 Hours

PART A

(Answer all questions. Each question carries 3 marks)

1. Explain any 2 basic elementary signals.
2. Check whether the following system is Time variant or not $y(n)=x(t^2)$.
3. State and prove any one property of Continuous Time Fourier Transform.
4. What is Nyquist rate in sampling?
5. Determine DTFT of $x(n)=a^n u(n)$.
6. What is meant by Region of Convergence?
7. Define IDFT of a discrete time sequence.
8. Find the DFT of the sequence $x(n)=\{1,1,0,0\}$.
9. Draw and explain the butterfly flowgraph of DIT radix-2 FFT.
10. Explain FIR Filters.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Find even and odd components of the following signals.
 - i) $x(t)=\sin t + 2\sin t + 2\sin^2 t.\cos t$ (8)
 - ii) $x(n)=\{1,0,-1,2,3\}$.
- b) Find whether the following signals are periodic or not, if periodic find the fundamental period $x(t)=\cos 60\pi t + \sin 50\pi t$. (6)

OR

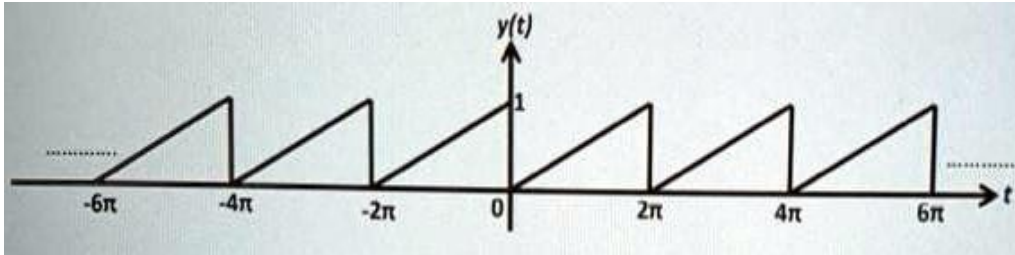
12. a) Find which of the following signals are energy signals, power signals, neither energy nor power signal
 - i) $x(t)=u(t)-u(t-1)$ (8)
 - ii) $x(t)=(1+e^{-5t})u(t)$
- b) Find whether the system is Linear or not $y(t)=t x(t)$. (6)

MODULE II

13. Find Continuous Time Fourier Transform of $e^{-|t|}$. Sketch the magnitude spectrum and phase spectrum. (14)

OR

14. Find the Trigonometric Fourier Series of the signal.



(14)

MODULE III

15. a) List any three properties of DTFT (6)
 b) Find the DTFT of the following (8)
 i) $x(n) = (0.5)^n u(n) + 2^n u(-n-1)$
 ii) $x(n) = a^{|n|}$.

OR

16. Find the inverse Z Transform of the following
 $X(Z) = (1 - Z^{-1} + Z^{-2}) / (1 - 0.5Z^{-1})(1 - 2Z^{-1})(1 - Z^{-1})$ with ROC's (14)
 i) $1 < |Z| < 2$
 ii) $|Z| > 2$
 iii) $|Z| < 0.5$

MODULE IV

17. a) Compute circular convolution of the following two sequences using DFT $x(n) = \{0, 1, 0, 1\}$, $h(n) = \{1, 2, 1, 2\}$. (8)
 b) State and prove any two properties of DFT. (6)

OR

18. Perform the linear convolution of the following sequences by i) Overlap add method ii) Overlap save method $x(n) = \{1, -1, 2, -2, 3, -3, 4, -4\}$, $h(n) = \{-1, 1\}$. (14)

MODULE V

19. Compute 8 point DFT of $x(n)$ by radix-2 DIF FFT $x(n) = \{2, 1, 2, 1, 1, 2, 1, 2\}$. (14)

OR

20. Realize the IIR filter system with difference equation, $y(n] = -0.1 y(n-1) + 0.72 y(n-2) + 0.7 x(n] - 0.252 x(n-2)$ in Direct form I, Direct form II and Cascade form. (14)
