Register No.: ……………………………   Name: …………………………………………………………..

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SIXTH SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 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. Sketch the signal $x(n)=u(n+2) - u(n-3)$.
2. Find whether the system is Stable or not
   $y(t)=(t+5)\, u(t)$.
3. Find the Fourier transform of $x(t)= \delta(t)$.
4. What is Nyquist rate in Sampling?
5. Determine DTFT of $x(n)= (0.5)^n\, u(n) + 2^n\, u(-n-1)$.
6. List any 3 properties of Z Transform.
7. Find DFT of the sequence $x(n)= \{1,-2,3,4\}$.
8. State complex conjugate symmetry property of DFT.
9. Draw the 4 point radix 2 DIF FFT Butterfly structure for DFT.
10. Compare FIR and IIR Filters.

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

MODULE I

11. a) Find whether the following signals are periodic or not, if periodic find the fundamental period
         i) $x(t)= 2\cos(10t+1) - \sin(4t -1)$ (6)
         ii) $x(t)=3\cos(17\pi t+\frac{\pi}{3}) + 2\sin(19\pi t - \frac{\pi}{3})$.

     b) Find which of the following signals are energy signals, power signals, neither energy nor power signals
         i) $x(t)=e^{-3t}\, u(t)$ (8)
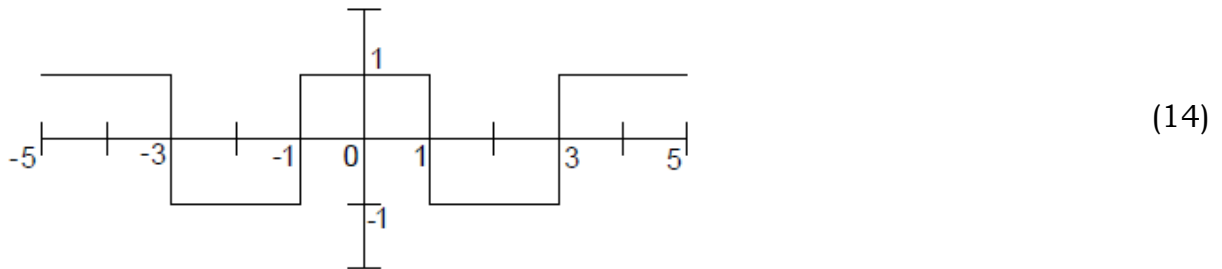   ii) $x(n)=(1/3)^n\, u(n)$.

OR

12. Check whether the following systems are
         i)   Static/Dynamic
         ii)   Linear/Non linear
         iii)   Causal/Non causal   (14)
         iv)   Time variant/Time invariant

a) $y(n)=x(n+1) - x(n-1)$

b) $y(t)=10x(t)+5$.

MODULE II

13. Find the Trigonometric Fourier Series for the periodic signal x(t).

(14)

OR

14. a) What is sampling theorem? How can we avoid aliasing? (8)

     b) State and prove Time shifting property of Fourier Transform. (6)

MODULE III

15. a) Find the Z Transform of the signal $x(n)=\sin\omega_0 n\, u(n)$ and hence find ROC. (8)

     b) List any 2 property of DTFT. (6)

OR

16. Find the Inverse of Z Transform of

$X(Z)= (\frac{1}{4} Z^{-1})/ (1-\frac{1}{2}Z^{-1}) (1-\frac{1}{4}Z^{-1})$ for i) ROC: $|Z|>\frac{1}{2}$ ii) ROC: $|Z|<\frac{1}{4}$. (14)

MODULE IV

17. a) Perform the circular convolution using concentric circle method of the following sequences $x(n)=\{1,1,2,1\}$; $h(n)=\{1,2,3,4\}$. (8)

     b) Find the IDFT of $Y(K)=\{1,0,1,0\}$. (6)

OR

18. Find the linear convolution of the sequences $x(n)=\{2,1,0,1,3,2,0,1,2,2\}$ and $h(n)=\{1,1,1\}$ using i) Overlap save method ii) Overlap add method. (14)

MODULE V

19. Find the DFT of the sequences $x(n)=\{1,2,3,4,4,3,2,1\}$ using DIT FFT algorithm. (14)

OR

20. a) Obtain the cascade realization of the FIR filter for the system function $H(Z)= 1+ \frac{5}{2} Z^{-1} + 2Z^{-2} + 2Z^{-3}$. (4)

     b) Obtain direct form and cascade form realization of the IIR filter for the system function $y(n)= -0.1y(n-1)+0.2y(n-2)+3x(n)+3.6x(n-1)+0.6x(n-2)$. (10)

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