Reg. No. : | | | | | | | | | | |

Question Paper Code: 94B04A

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2021

Fourth Semester

Biomedical Engineering

19UBM404-PRINCIPLES OF SIGNALS AND SYSTEMS

(Regulation 2019)

Duration: 1:45 hrs Maximum: 50 Marks

PART A - (10 x 2 = 20 Marks)

Answer any ten of the following questions

1. Give the graphical and mathematical representation of Unit step sequence and Unit ramp sequence. (CO1: Understand)
2. Differentiate continuous time signal and discrete time signals. (CO1: Understand)
3. Determine odd and even components of the signal $x(t)=e^{jt}$. (CO1: Apply)
4. Find the Laplace transform of $\cos\omega_o t\, u(t)$ using property. (CO2: Apply)
5. State Dirichlets conditions. (CO2: Understand)
6. Determine the Fourier transform of sgn function. (CO2: Apply)
7. Check whether the causal system with transfer function H(s)=1/(s-2) is stable. (CO4: Apply)
8. Write Nth order differential equation and its Laplace transform. (CO3: Understand)
9. Determine the response of the system with impulse response h(t)=tu(t) for the input signal x(t) =u(t). (CO3: Apply)
10. State the condition for existence of DTFT? (CO2: Understand)
11. Obtain inverse z-transform of X(z)=1/(z-a), |z|>|a|. (CO4: Apply)
12. Determine z-transform of the sequence x[n]={1,2,3,4}. (CO2: Apply)
13. Give the relationship between impulse response and transfer function of DT-LTI system. (CO4: Understand)

14. Determine the convolution of the two sequence x[n]={1,1,1,} and h[n]={2,2}. (CO4: Apply)

15. Obtain convolution of x[n] and δ[n]. (CO4: Apply)

PART -- B (3 x 10 = 30 Marks)

Answer any three of the following questions

16. For each of the following input-output relationship, check whether the corresponding system is linear, time invariant and causal. (CO1: Apply)
    (a) $y(t)=t^2x(t-1)$ [5]
    (b) $y[n]=x^2[n-2]$ [5]

17. Prove convolution and multiplication properties of Laplace transform. (CO2: Understand)

18. A pressure gauge that can be modeled as an LTI system has a time response to a unit step input given by $(1 - e^{-t} - te^{-t})u(t)$. For a certain input x(t), the output is observed to be $(2 - 3e^{-t} + e^{-3t})u(t)$. For this observed measurement, determine the true pressure input to gauge as a function of time. (CO4: Analyze)

19. Consider a discrete time LTI system with impulse response

$$h[n] = \left(\frac{1}{2}\right)^n u[n]$$

Use Fourier transforms to determine the response to each of the following input signal

$$i)\ x[n] = \left(\frac{3}{4}\right)^n u[n]$$

$$ii)\ x[n] = (n+1)\left(\frac{1}{4}\right)^n u[n]$$

(CO4: Analyze)

20. Consider an LTI system with impulse response

$$h[n] = \begin{cases} a^n & n \geq 0 \\ 0 & n < 0 \end{cases}$$

and input

$$x[n] = \begin{cases} 1 & 0 \leq n \leq N-1 \\ 0 & otherwise \end{cases}$$

Determine the output y[n] by explicitly evaluating the discrete convolution of x[n] and h[n]. (CO4: Apply)