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

Question Paper Code : 90175

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Third Semester

Electronics and Communication Engineering

EC 8352 – SIGNALS AND SYSTEMS

(Common to Medical Electronics/Biomedical Engineering/Computer and Communication Engineering/Electronics and Telecommunication Engineering)

(Regulations – 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Determine whether the signal $x(t) = \sin\sqrt{2}t$ is periodic or not.
2. Give an example for deterministic and random signals.
3. State Gibbs Phenomenon.
4. Find the Fourier series coefficients of the signal $x(t) = 1 + \sin\frac{\pi}{2}t$.
5. Two systems with impulse responses $h_1(t) = e^{-at}\,u(t)$ and $h_2(t) = u(t-1)$ are connected in parallel. What is the overall impulse response h(t) of the system ?
6. The input – output relationship of a system is given by

   $\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 2y = \frac{dx}{dt}$.

   Find the system function H(s) of the system.
7. Find the Nyquist rate of the signal $x(t) = \cos 200\pi t + \sin 400\pi t$.
8. Find the z-transform and its associated ROC for the signal $x[n] = \delta[n+1] + 2\,\delta[n] - 3\,\delta[n-2]$.
9. Convolve the following signals $x[n] = \{\underset{\uparrow}{1}, 2, 3\}$ $h[n] = \{1, 2\}$
10. Determine whether the following system is a recursive system and justify your answer $y[n] = 2x[n] + 3x[n-1] - 2x[n-2]$.

PART – B (5×13=65 Marks)

11. a) Plot the following signals, given x[n] :

i) $x[n] = \{1, 2, 1, \underset{\uparrow}{2}, 1, 2, 1\}$ (2)

ii) $x[n-1]$ (2)

iii) $x[2n]$ (2)

iv) $x[n/2]$ (2)

v) $x\left[\frac{n}{2}-1\right]$ (2)

vi) $x\left[-\frac{n}{2}-1\right]$ (3)

(OR)

b) Determine whether the following system is Linear, Time Invariant, Causal, Memoryless and Stable.

$y[n] = nx[n]$

12. a) Find the Fourier transform of the signal $x(t) = e^{-\alpha|t|}$, $\alpha > 0$ and plot its spectrum.

(OR)

b) Specify all possible ROC's for the function X(s) given below. Also find x(t) in each case.

$$X(s) = \frac{4s}{(s+2)(s+4)}$$

13. a) Convolve the following signals $x(t) = u(t)$ $h(t) = u(t) - u(t-2)$.

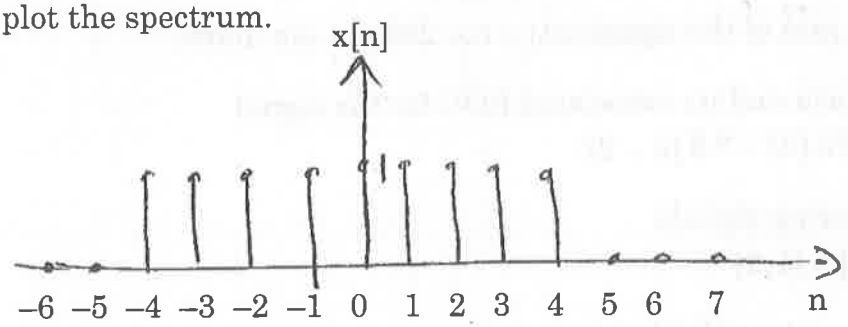
(OR)

b) An LTI system which is initially at rest is described by the differential equation

$$\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 2y = \frac{dx}{dt} + 3x.$$

Find the system function H(s) and the impulse response h(t).

14. a) Find the DTFT of the rectangular pulse sequence shown below and also plot the spectrum.



(OR)

b) Given the z – transform of a sequence x[n] as $X(z) = \frac{z}{z-1}$

Find the z – transform of the following signals in terms of X(z) using properties of z – transform.

i) x[n – 1] **(3)**

ii) x[–n] **(3)**

iii) α^n x[n] **(3)**

iv) nx[n] **(4)**

15. a) Convolve the following signals $x[n] = \alpha^n u[n]$ $h[n] = u[n-1]$.

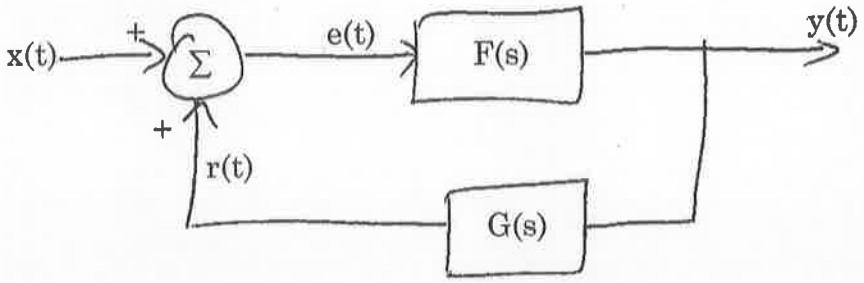
(OR)

b) Consider a DT LTI system whose system function H(z) is given by $H(z) = \frac{z}{z-0.5}$ $|z| > 0.5$.

Find the step response of the system.

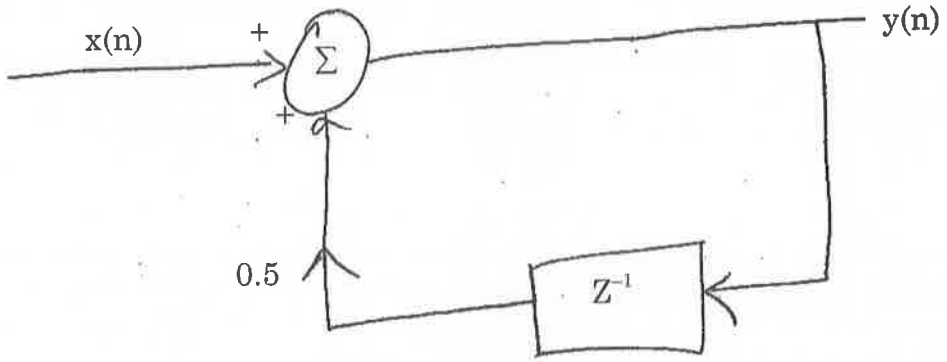
PART – C **(1×15=15 Marks)**

16. a) The feedback interconnection of two causal subsystems with system functions F(s) and G(s) is shown below. Find the overall system function H(s) for this feedback system.



(OR)

b) Consider the discrete time LTI system shown below.



Find the frequency response $H(e^{j\omega})$ and the impulse response h(n) of the system. Sketch the magnitude response $|H(e^{j\omega})|$ for the system.