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**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
$$x[n] = \{1, 2, 3\} \quad h[n] = \{1, 2\}$$
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)  $x[n] = \{1, 2, 1, 2, 1, 2, 1\}$  (2)
- ii)  $x[n-1]$  (2)
- iii)  $x[2n]$  (2)
- iv)  $x[n/2]$  (2)
- v)  $x[\frac{n}{2}-1]$  (2)
- vi)  $x[-\frac{n}{2}-1]$  (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  $x(t) = u(t)$   $h(t) = u(t) - u(t-2)$ .

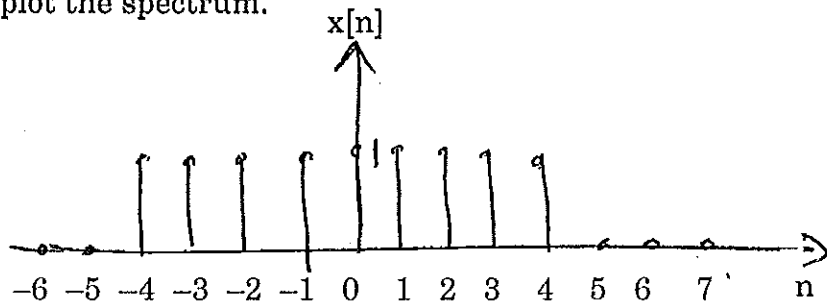
(OR)

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)  $\alpha^n x[n]$  (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

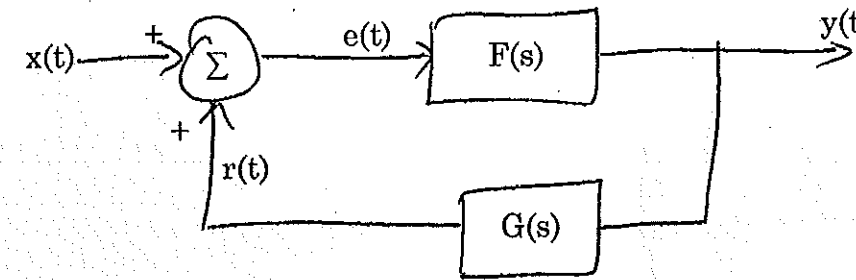
$$H(z) = \frac{z}{z-0.5} \quad |z| > 0.5.$$

Find the step response of the system.

PART - C

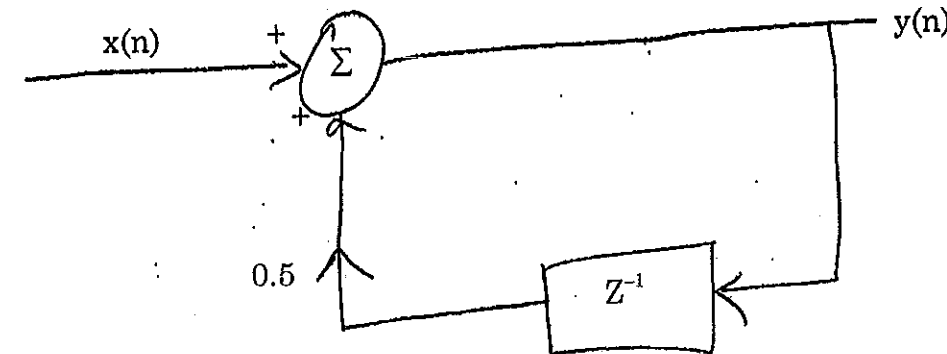
(1×15=15 Marks)

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.