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GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, May – 2021

(Eighth Semester)

BELPE 8011 / BEEPE 8011 – SIGNALS AND SYSTEMS

(E.E and E.E.E)

Time: 2 hrs

Maximum: 50 Marks

Answer ALL Questions**The figures in the right hand margin indicate marks.****PART – A: (Multiple Choice Questions)****(1 x 10 = 10 Marks)**

- Q.1. Answer ALL questions** [CO#] [PO#]
- a. A discrete signal is said to be odd or asymmetric if $x(-n)$ is equal to [CO1] [PO1]
- (i) $X(n)$ (ii) 0
- (iii) $-x(-n)$ (iv) ∞
- b. Check whether $x[n] = 7 \sin(4\pi n)$ is periodic and if it is period calculate its [CO1] [PO1]
- fundamental period?
- (i) Periodic with fundamental period 6π (ii) Periodic with fundamental period 3
- (iii) Periodic with fundamental period 1 (iv) Periodic with fundamental period 5
- c. $x(n) * \delta(n-k) = ?$ [CO1] [PO1]
- (i) $x(k)$ (ii) $x(n)$
- (iii) $x(k) * \delta(n-k)$ (iv) $x(k) * \delta(k)$
- d. Is the function $y[n] = y[n-1] + x[n]$ stable in nature? [CO2] [PO1]
- (i) It is stable (ii) It is unstable
- (iii) Both stable and unstable (iv) None of the mentioned
- e. Which of the following is a causal system? [CO2] [PO1]
- (i) $y(n) = 3x(n) - 2x(n-1)$ (ii) $y(n) = 3x(n) + 2x(n+1)$
- (iii) $y(n) = 3x(n+1) + 2x(n-1)$ (iv) $y(n) = 3x(n+1) + 2x(n-1) + x(n)$
- f. Weighted superposition of time-shifted impulse responses is termed as _____ for [CO1] [PO1]
- discrete-time signals.
- (i) Convolution integral (ii) Convolution multiple
- (iii) Convolution sum (iv) Convolution
- g. The convolution of $x(n) = \{1, 2, 3, 1\}$ and $h(n) = \{1, 2, 1, -1\}$, origin at 2, is? [CO2] [PO2]
- (i) $\{1, 4, 8, 8, 3, -2, -1\}$, origin at 4 (ii) $\{1, 4, 8, 8, 3, -2, 1\}$, origin at 4
- (iii) $\{1, 3, 8, 8, 3, -2, -1\}$, origin at 4 (iv) $\{1, 4, 8, 3, -2, -1\}$, origin at 4
- h. Impulse response is the output of _____ system due to impulse input applied at [CO2] [PO1]
- time=0?
- (i) Linear (ii) Time varying
- (iii) Time invariant (iv) Linear and time invariant
- i. The ROC of z -transform of the discrete time sequence [CO4] [PO1]
- $x(n) = \left(\frac{1}{3}\right)^n u(n) - \left(\frac{1}{2}\right)^n u(-n-1)$ is
- (i) $|z| < \frac{1}{3}$ (ii) $|z| > \frac{1}{2}$

$$(iii) \frac{1}{3} < |z| < \frac{1}{2}$$

$$(iv) 2 < |z| < 3$$

j. Consider the z-transform $X(z) = 5z^2 + 4z^{-1} + 3; 0 < |z| < \infty$. The inverse z- CO4 PO2 transform $x[n]$ is

$$(i) 5\delta[n+2] + 3\delta[n] + 4\delta[n-1] \quad (ii) 5\delta[n-2] + 3\delta[n] + 4\delta[n+1]$$

$$(iii) 5u[n-2] + 3u[n] + 4u[n+1] \quad (iv) 5u[n+2] + 3u[n] + 4u[n-1]$$

PART – B: (Short Answer Questions)

(2 x 5 = 10 Marks)

Q.2. Answer ALL questions

[CO#] [PO#]

- a. Find the even and odd part of signal $x(n) = \{4, -4, 2, 2\}$ [CO2] [PO2]
- b. What is the difference between energy signal and power signal? [CO2] [PO1]
- c. Test the $y(n) = x(n) - x(n-1)$ is a static or dynamic system. [CO2] [PO1]
- d. Determine the range of values of a and b for which LTI system with impulse response [CO2] [PO2]

$$h(n) = \begin{cases} a^n & n \geq 0 \\ b^n & n \leq 0 \end{cases}$$

- e. What is the Z-transform of the sequence $x(n) = \begin{cases} 1; & 0 < n < 10 \\ 0; & \text{otherwise} \end{cases}$ CO4 PO2

PART – C: (Long Answer Questions)

(6 x 5 = 30 Marks)

Answer ANY FIVE questions

Marks [CO#] [PO#]

- 3. Determine the cross correlation $r_{xy}(l), x(n) = \{-1, 3, 7, 1, 2, -3\}, y(n) = \{1, -1, 2, -2, 4, 1, -2, 5\}$ (6) CO1 PO2
- 4. Identify whether the following system is linear, time invariant, stable and invertible (1) $y(n) = x^2(n)$ (2) $y(n) = x(n) \cos \omega_0 n$ (3) $y(n) = A x(n) + B$ (6) CO1 PO2
- 5. What is the zero-input response of the system described by the homogenous second order equation $y(n) - 3y(n-1) - 4y(n-2) = 0$ if the initial conditions are $y(-1) = 5$ and $y(-2) = 0$? (6) CO2 PO1
- 6. Find the response of the system described by difference equation $y(n) + 2y(n-1) = y(n-2) = x(n) + x(n-1)$ for $x(n) = \left(\frac{1}{2}\right)^n u(n)$ with $y(-1) = y(-2) = 1$ (6) CO2 PO1
- 7. Determine the response of LTI SYSTEM whose $x(n) = \{1, 2, 3, 1\}$ and $h(n) = \{1, 2, 1, -1\}$ in time domain. (6) CO3 PO1
- 8. Find the normalized cross correlation of sequence $x(n) = \{1, 1, 2, 2\}$ and $h(n) = \{1, 3, 1\}$? (6) CO2 PO2
- 9. Consider an LTI system with impulse response $h[n] = \alpha^n u[n]$ and the input to this system is $x[n] = \beta^n u[n]$ with $|\alpha|$ & $|\beta| < 1$. Identify the response $y[n]$ when $\alpha \neq \beta$ (6) CO4 PO2
- 10. A LTI system is characterized by $H(z) = \frac{3-4z^{-1}}{1-3.5z^{-1}+1.5z^{-2}}$ specify the ROC of H(Z). Determine h(n) when system is stable, system is casual and system is antic usual mention ROC also for each case. (6) CO4 PO2

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