

01402

**B.Tech. IN ELECTRONICS AND
COMMUNICATION ENGINEERING
(BTECVI)**

Term-End Examination

December, 2011

BIEL-007 : SIGNALS AND SYSTEMS

Time : 3 hours

Maximum Marks : 70

Note : Attempt *any seven* questions.

All questions carry equal marks.

Use of scientific calculator is allowed.

1. (a) Determine the value of Power and energy for the given signals 5
 (i) $x(t) = u(t)$ (ii) $x(t) = tu(t)$.
 (b) State which signal is Power Signal ? What is signal ? List the various operations, which can be performed on a signal. Explain any three of them. 5

2. An interconnection of LTI (Linear time invariant) system is shown in Fig.1 The impulse responses 10
 are $h_1(n) = \left(\frac{1}{2}\right)^n [u(n) - u(n-3)]$; $h_2(n) = \delta(n)$
 and $h_3(n) = u(n-1)$. Let the impulse response of

the overall system from $x(n)$ to $y(n)$ be denoted as $h(n)$. Express $h(n)$ in terms of $h_1(n)$, $h_2(n)$ and $h_3(n)$ also evaluate $h(n)$.

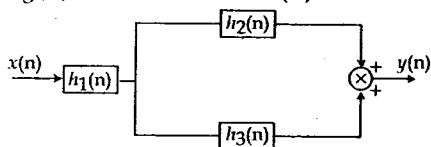


fig. (1)

3. What is the input signal $x(n)$ that will generate the output sequence ? 10

$y(n) = \{1, 5, 10, 11, 8, 4, 1\}$ for a system with impulse response $h(n) = \{1, 2, 1\}$?

4. A signal $x(t)$ is Periodic and one period of it is represented by 10

$$x(t) = \begin{cases} 0 & -T/2 < t < -T/4 \\ A & -T/4 < t < T/4 \\ 0 & T/4 < t < T/2 \end{cases}$$

Sketch the Signal and find its Fourier series representation.

5. Evaluate the convolution $y(n) = x(n) * h(n)$ of the sequences. 10

$$h(n) = \begin{cases} a^n & 0 \leq n < N \\ 0 & \text{else where} \end{cases}$$

$$x(n) = \begin{cases} b^{n-m} & m \leq n \\ 0 & n < m \end{cases}$$

6. Calculate the frequency response for the LTI systems representation. 10

(a) $h(n) = \delta(n) - \delta(n-1)$

(b) $h(n) = (0.9)^n \left(e^{j\frac{\pi}{2}} \right)^n u(n)$

7. (a) Determine the convolution of the pairs of signals by means of the Z transform 5

$$x_1(n) = \left(\frac{1}{2} \right)^n u(n); x_2(n) = [\cos(\pi n)] \cdot u(n)$$

- (b) Determine the zero response of the system 5

$$y(n) = \frac{1}{2} y(n-1) + 4x(n) + 3x(n-1) \text{ to the}$$

$$\text{input } x(n) = e^{j\omega_0 n} \cdot u(n).$$

8. Find the inverse Z-transform of 10

$$x(z) = \frac{z^2 + z}{(z-1)(z-3)}, \text{ ROC : } |z| > 3 \text{ using partial}$$

fraction expansion and Convolution Method.

9. A causal system is represented by the following difference equation 10

$$y(z) + \frac{1}{4} z^{-1} y(z) = x(z) + \frac{1}{2} z^{-1} x(z).$$

Find the system transfer function $H(z)$, unit sample response and frequency response of the system.

10. Write short note on the following (*Any Two*) $5 \times 2 = 10$
- (a) Initial and final value theorem
 - (b) Properties of frequency response of an LTI system
 - (c) Discrete time system.
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