No. of Printed Pages : 4

BIEL-007

B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

00396 **June, 2015**

BIEL-007 : SIGNALS AND SYSTEMS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions.*

1. Determine if the following system described by

$$y(t) = \sin [x(t + 2)]$$

is memoryless, causal, linear, time invariant and stable. *10*

2. Determine the convolution of the two continuous-time functions given below : *10*

$$x(t) = 3 \cos 2t \quad \text{for all } t$$

and $$h(t) = e^{-|t|} = \begin{cases} e^{t} & \text{for } t < 0 \\ e^{-t} & \text{for } t \geq 0. \end{cases}$$

3. The system shown in Figure 1 is formed by connecting two systems in cascade. The impulse responses of the systems are given by $h_1(t)$ and $h_2(t)$ respectively and $h_1(t) = e^{-2t}\, u(t)$, $h_2(t) = 2e^{-t}\, u(t)$.

(a) Find the impulse response h(t) of the overall system shown in Figure 2.

(b) Determine if the overall system is BIBO stable. *10*

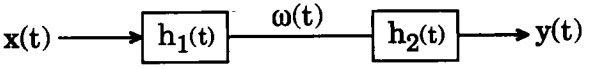

Figure 1

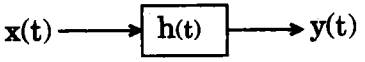

Figure 2

4. Figure 3 shows the periodic rectangular waveform. Obtain its Fourier series representation. *10*

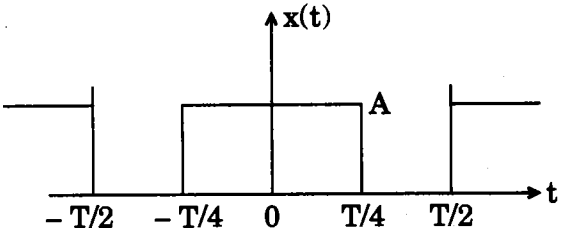

Figure 3

5. (a) Derive the Fourier transform for Signum function. *5*

(b) Discuss the properties of Fourier transform. *5*

6. The frequency response $H(j\omega)$ of a causal LTI filter is as shown in Figure 4. Find the filtered output signal $y(t)$ for the input signals $x(t) = \sin(\omega_0 t)\, u(t)$. *10*

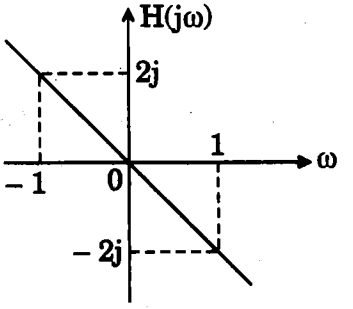

Figure 4

7. Find the Z-transform of the following sequence : *10*

$$x(n) = \begin{cases} 2^n & n < 0 \\ \left(\frac{1}{2}\right)^n, & n = 0, 2, 4 \\ \left(\frac{1}{3}\right)^n, & n = 1, 3, 5 \end{cases}$$

8. (a) Determine whether or not the signal given below is periodic and determine the fundamental period, if the signal is periodic : 5

$$x(n) = \sin(\pi + 0{\cdot}2n)$$

(b) Find the even part of the following signal : 5

$$x(n) = u(n)$$

9. Write short notes on any ***two*** of the following : *2×5=10*

(a) Properties of Z-transform

(b) Applications of Z-transform

(c) Properties of non-linear systems