No. of Printed Pages : 5

BIEL-007

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

Term-End Examination

00876 **June, 2016**

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. All the questions are to be answered in English language only.*

1. Sketch the signals : *10*

(a) $u(t-5) - u(t-7)$

(b) $u(t-5) + u(t-7)$

(c) $t^2 [u(t-1) - u(t-2)]$

(d) $(t-4) [u(t-2) - u(t-4)]$

(e) $A [u(t + \frac{T}{2}) - u(t - \frac{T}{2})]$

2. (a) Find the even and odd components of $x(t) = e^{jt}$. *5*

(b) Show that the product of two even signals or of two odd signals is an even signal. *5*

3. (a) Determine whether the following signals are energy signals, power signals, or neither : 5

(i) $x(t) = e^{-at}\, u(t),\ a > 0$

(ii) $x(t) = t\, u(t)$

(b) For the signal shown in Figure 1, sketch and label each of the following signals : 5

(i) $f(-t)$

(ii) $f(t + 6)$

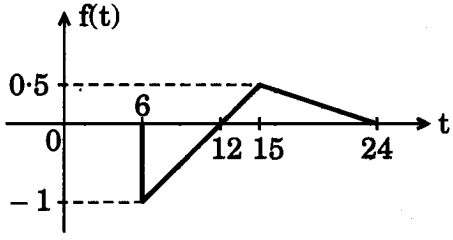

Figure 1

4. Show that : 10

(a) $x[n] * \delta[n] = x[n]$

(b) $x[n] * \delta[n - n_0] = x\,[n - n_0]$

(c) $x[n] * u[n] = \sum_{k=-\infty}^{n} x[k]$

(d) $x[n] * u\,[n - n_0] = \sum_{k=-\infty}^{n - n_0} x[k]$

5. Evaluate y[n] = x[n] * h[n], where x[n] and h[n] are shown in Figure 2,

(a) by an analytical technique,

(b) by a graphical method. *10*

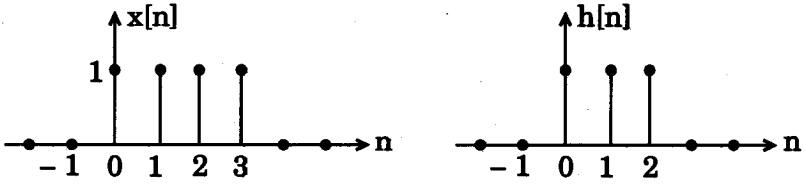

Figure 2

6. Consider the discrete time system in Figure 3. Write a difference equation that relates the output y[n] and the input x[n]. *10*

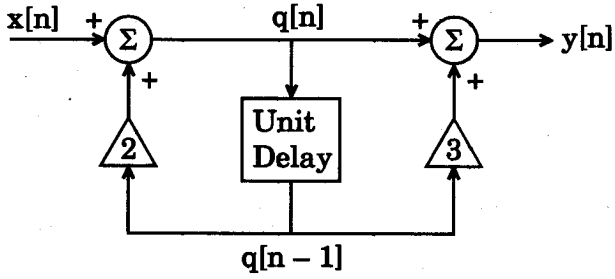

Figure 3

7. (a) Find the trigonometric Fourier series for x(t) shown in Figure 4. *5*

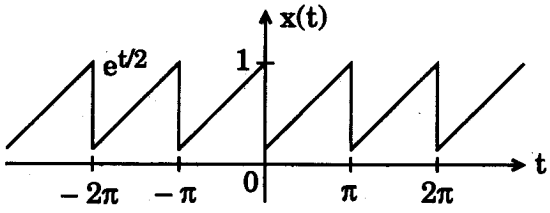

Figure 4

(b) Find the Fourier transform of the rectangular pulse x(t), defined by 5

$$x(t) = \begin{cases} 1, & |t| < a \\ 0, & |t| > a \end{cases}$$

8. (a) Find the Fourier transform of the signum function, sgn(t), which is defined as 5

$$\text{sgn}(t) = \begin{cases} 1, & t > 0 \\ -1, & t < 0 \end{cases}$$

(b) Find the Fourier transform of the periodic impulse train defined as 5

$$\delta_{T_0}(t) = \sum_{k=-\infty}^{\infty} \delta(t - kT_0)$$

9. Find the Z-transform x[z] and sketch the pole-zero plot with the ROC for each of the following sequences : *3+3+4=10*

(a) $x[n] = \left(\frac{1}{2}\right)^n u[n] + \left(\frac{1}{3}\right)^n u[n]$

(b) $x[n] = \left(\frac{1}{3}\right)^n u[n] + \left(\frac{1}{2}\right)^n u[-n-1]$

(c) $x[n] = \left(\frac{1}{2}\right)^n u[n] + \left(\frac{1}{3}\right)^n u[-n-1]$

10. (a) Find the inverse Z-transform of $x(z) = \frac{3}{z-2}$, $|z| > 2$. *5*

(b) Write down the properties of ROC in Z-transform. *5*