No. of Printed Pages : 4

BIEL-007

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

Term-End Examination

June, 2012

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. Determine whether or not the signals below are periodic, and for each signal that is periodic, determine the fundamental period : **10**

(a) $x[n] = \cos\left(\frac{2\pi n}{5}\right) + \cos\left(\frac{2\pi n}{7}\right)$

(b) $x[n] = \cos\left(\frac{n}{10}\right)\cos\left(\frac{n\pi}{10}\right)$

(c) $x(t) = 2\ \cos 100\pi t + 5\sin 50t$

(d) $x[n] = e^{(j\pi/16)n}\cos\left(\frac{n\pi}{17}\right)$

(e) $x(t) = 10\cos^2(10\pi t)$

2. The impulse response of LTI system is given below. Check whether the following systems are memory less, stable and causal **10**

(a) $h(t) = e^{-2t}u(t-1)$

(b) $h(t) = e^{-4t}u(t+10)$

(c) $h(t) = te^{-t}u(t)$

(d) $h(n) = n\left(\frac{1}{2}\right)^n u(n)$

(e) $h(n) = 2u(n) - 2u(n-5)$

3. (a) Determine and sketch the convolution of the following two signals : **5**

$$x(t) = \begin{cases} t+1, & 0 \le t \le 1 \\ 2-t, & 1 < t \le 2 \\ 0, & \text{elsewhere} \end{cases}$$

and $h(t) = \delta(t+2) + 2\delta(t+1)$

(b) Show that the convolution of an odd and an even function is an odd function. **5**

4. Find the transfer function of a causal continuous time LTI system described by differential equation **10**

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = s(t)$$

With the initial conditions assume to be zero. Also, find the response of the system to input $s(t) = 2u(t)$

5. Find the trigonometric Fourier series for the wave form shown in Fig.1 **10**

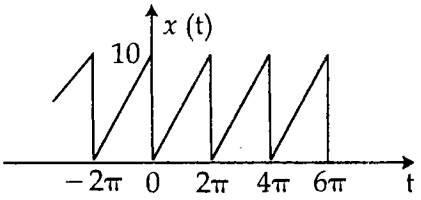

Fig. 1 Aperiodic signal

6. (a) Determine the Fourier Transform (CTFT) of the signal **5**

$$x(t)=\frac{1}{2}\left[\delta(t+1)+\delta(t-1)+\delta\left(t+\frac{1}{2}\right)+\delta\left(t-\frac{1}{2}\right)\right]$$

(b) Find the continous time Fourier transform of the following : **5**

$$x(t)=\begin{cases}\dfrac{At}{t_P-t_Q}+\dfrac{At_P}{t_P-t_Q}; \text{ for } -t_P<t<-t_Q\\ A, \text{ ; for } -t_Q<t<t_Q\\ \dfrac{At_P}{t_P-t_Q}-\dfrac{At}{t_P-t_Q}; \text{ for } t_Q<t<t_P\end{cases}$$

7. Determine the inverse Z - transform of the function. **10**

$$x(z)=\frac{Z^2}{Z^2-\left(\frac{5}{4}\right)Z+\frac{3}{8}}$$

8. Find the Z - transform of the following discrete - time signal. Also determine the ROC for each of the following. **10**

(a) $S(n) = 2^{\pi} u(n) + 3\left(\frac{1}{2}\right)^{n} u(n)$

(b) $S(n) = 3\left(-\frac{1}{2}\right)^{n} u(n) - 2(3)^{n} u(-n-1)$

9. For the discrete time system described by the following difference equation. **10**

$y(n) = 0.6(n-1) - 0.08y(n-2) + x(n)$

Determine :

(a) The unit -sample response sequence, h(n)

(b) The step - response sequence g(n)

(c) Whether it is BIBO stable.

10. Write short notes on ***any two*** : **5x2=10**

(a) Properties of Z – transform.

(b) Region of convergence (ROC).

(c) Linear time Invariant (LTI) system.