Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL - MAY 2017

SUBJECT: SIGNALS AND SYSTEMS [ELE 2201]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 21, April 2017** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Transform Table may be supplied.

1A. Determine whether the following signal is energy or power signal and also find the energy and power of the signal

$$x(t)=\begin{cases}2\left(1-\left|\left(\frac{t}{4}\right)\right|\right) & ;\ \text{for } |t|<4\\ 0 & ;\ otherwise\end{cases}$$

(03)

1B. A continuous time signal is expressed as $x(t)=\begin{cases}0 & ;\ for\, t<-2\\ -(t+2) & ;\ for\ -2\le t<-1\\ -1 & ;\ for\ -1\le t<0\\ 1 & ;\ for\ 0\le t<1\\ -2(t-2) & ;\ for\ 1\le t\le 2\end{cases}$

Sketch and label the following (i) $x(t)$ (ii) $x\left(2-\frac{1}{2}t\right)$ (iii) $x(-2-2t)$

(03)

1C. Find the response of an LTI system using convolution sum $y[n]=x[n]*h[n]$

Given: $x[n]=u[n+2]-u[n-5]$ and $h[n]=\beta^{n}\{u[n+2]-u[n-5]\}$; $|\beta|<1$

(04)

2A. Check whether the following time signal is periodic. If periodic determine the fundamental period. (i) $x(n)=\mathrm{Re}\left\{e^{j2\pi n/5}\right\}+\mathrm{Im}\left\{e^{j4\pi n/7}\right\}$ (ii) $x(t)=t\,u(t)$

(04)

2B. The impulse response of the system is given below. Determine whether the given is causal, stable, and memory less. (i) $h[n]=\left(\frac{1}{2}\right)u[n+2]$ (ii) $h(t)=2\delta(t+1)$

(03)

2C. Two causal LTI systems with unit sample response $h_1[n]$ and $h_2[n]$ are connected in cascade as shown in Fig. Q2C. If the input $x[n]=2\delta[n]+\delta[n-1]$, $h_2[n]=\left\{\underset{\uparrow}{1}, -1\right\}$, and the output from the system is $y[n]=\left\{\underset{\uparrow}{1}, 2, 1, -2, \right\}$, compute $h_1[n]$. ***(03)***

3A. Find the DTFS coefficient of the discrete time signal $x[n]$. Plot the magnitude and phase spectrum.

$$x[n]=1+\cos\left(\frac{6\pi}{11}n\right)+\sin\left(\frac{3\pi}{11}n\right)$$

(03)

3B. Using time domain method obtain the complete response of an LTI system described by the difference equation:

$$y[n]+\frac{4}{9}y[n-1]-+\frac{1}{27}y[n-2]=2x[n];\quad \text{Given: } x[n]=2u[n];\, y[-1]=1,\ y[-2]=-1$$

(05)

3C. State and prove Parseval's relations for CTFT. ***(02)***

4A. Find the exponential Fourier series coefficient of a periodic continuous time signal $x(t)$ shown in Fig. Q4A. ***(03)***

4B. Use defining equation to find aperiodic continuous -time signal $x(t)$ for magnitude and phase spectra shown in Fig. Q.4B. ***(03)***

4C. A discrete-time aperiodic signal is given as :

$$x[n]=\left\{1, 2, \underset{\underset{0}{\uparrow}}{3}, 2, 1\right\}$$, evaluate the following without finding $X[e^{j\Omega}]$;

(i) $X\left[e^{j0}\right]$; (ii) $\angle X\left[e^{j\Omega}\right]$; (iii) $\int_{-\pi}^{\pi} X\left[e^{j\Omega}\right]d\Omega$; (iv) $\int_{-\pi}^{\pi}\left|X[e^{j\Omega}]\right|^2 d\Omega$ ***(04)***

5A. (i) A discrete-time aperiodic signal $x[n]$ has its DTFT given by $X\left[e^{j\Omega}\right]=\frac{1}{1-ae^{-j\Omega}}$, using properties, find the DTFT of (a) $y[n]=x[n]\cos(0.4\pi n)$

(ii) Find $x[n]$ if it's DTFT is $X\left[e^{j\Omega}\right]=4\cos^2\Omega$. Use properties.

(04)

5B. Determine the Z-Transform and the ROC of the two-sided signal $x[n]=(0.5)^{|n|}$ ***(04)***

5C. Find the Z-transform of the following time-domain signal,

$x[n]=\left(\frac{1}{3}\right)^n u[n]*\left(\frac{1}{5}\right)^n u[n]$. Also mention the individual and combined ROC. ***(02)***

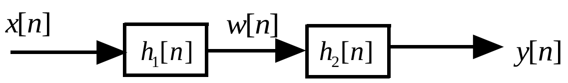

Fig.Q2C

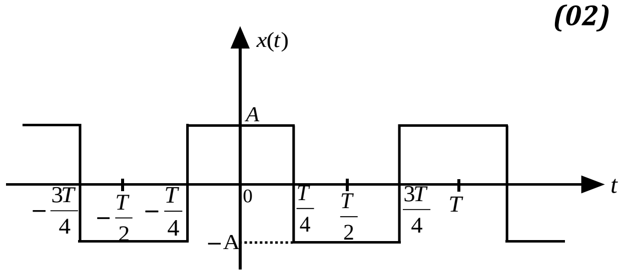

Fig. Q4A

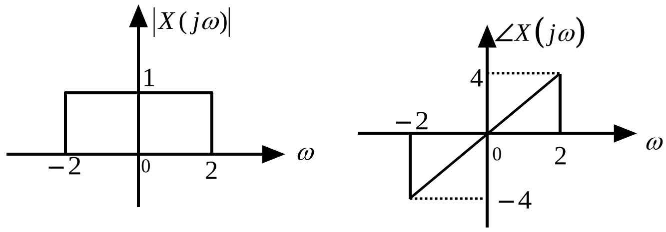

Fig.Q.4B