Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKE UP EXAMINATIONS, JUNE 2018

SUBJECT: SIGNALS AND SYSTEMS [ELE 2201]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 14 June 2018** **Max. Marks: 50**

Instructions to Candidates:

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

1A. A continuous time signal $x(t)$ is given as

$$x(t)=\begin{cases}0 & ; \quad -5<t\\ t+5 & ; \quad -5\le t\le -4\\ 1 & ; \quad -4\le t\le 4\\ 5-t & ; \quad 4\le t\le 5\\ 0 & ; \quad t>5\end{cases}$$

Sketch $y(t)=x(10t-5)$ and also determine the energy of signal $y(t)$. ***(04)***

1B. Find whether the following signals are periodic? If periodic find the fundamental period.

(i) $x(t)=\cos\left(\frac{4\pi t}{5}\right)+3\sin\left(\frac{8\pi t}{3}\right)$ (ii) $x[n]=\cos\left[\frac{\pi n}{4}\right]+\sin[n]$ ***(03)***

1C. The input $x[n]$ and the impulse response $h[n]$ of a LTI system is given by $x[n]=u[n]-u[n-5]$ and $h[n]=u[n+1]-u[n-10]$. Use convolution sum to evaluate the output $y[n]$ of the LTI system. ***(03)***

2A. Determine whether the system represented by input- output relationship are (i) linear (ii) time-invariant and (iii) causal.

(a) $y[n]=\cos(x[n])$; (b) $y(t)=t\,x(t)$ ***(02)***

2B. The input to an LTI system is $x(t)=\begin{cases}2; & -2\le t\le 2\\ 0; & otherwise\end{cases}$ and its impulse response is

$h(t)=\begin{cases}4 & ;\ 0\le t\le 2\\ 0 & ;otherwise\end{cases}$

Using convolution integral determine the response $y(t)$ and also sketch the output $y(t)$

(04)

2C. Obtain the forced response of an LTI system described by the difference equation:

$y[n]+\frac{3}{4}y[n-1]+\frac{1}{8}y[n-2]=x[n]+x[n-1]$. Given: $x[n]=\left(\frac{1}{3}\right)^n u[n]$;

$y[-1]=y[-2]=0$

(04)

3A Find the Exponential Fourier series coefficient of a periodic continuous time signal $x(t)$ shown in Fig. Q. 3A. Also plot the magnitude spectrum.

(04)

3B. Use defining equation to find the inverse Fourier transform of $X(j\omega)=e^{-|\omega|}$

(03)

3C. Obtain the Fourier transform of aperiodic signal $x(t)=u(t)+u(t-2)-2u(t-4)$ by using the Fourier transform (FT) of rectangular pulse $g(t)=\begin{cases}1 & ;\ |t|<1\\ 0 & ;\ |t|>1\end{cases}$

(03)

4A. Use defining equation determine DTFS coefficients $X(k)$ for discrete time periodic signal given by

$x[n]=1+\cos\frac{\pi}{3}n+\sin\frac{\pi}{4}n$. Also plot its magnitude spectrum.

(03)

4B. Given that $x[n]=n\left(\frac{-3}{2}\right)^n u[n]\leftrightarrow \mathrm{X}\left(e^{j\Omega}\right)$. Without evaluating $\mathrm{X}\left(e^{j\Omega}\right)$, find $y[n]$ for the following

(i) $Y\left(e^{j\Omega}\right)=e^{-j2\Omega}X\left(e^{j\Omega}\right)$ (ii) $Y\left(e^{j\Omega}\right)=\frac{d}{d\Omega}\left\{e^{j2\Omega}X\left(e^{j\Omega}\right)\right\}$

(03)

4C. Find the DTFT of aperiodic discrete time signal $x[n]=a^{|n|}$; $|a|<1$ using defining equation and also plot its magnitude spectrum.

(04)

5A. Find the DTFT of a given discrete time aperiodic signal using properties.

$x[n]=n.e^{j\frac{\pi}{4}n}\left(\frac{1}{2}\right)^n u[n-2]$

(04)

5B. Find the inverse z-transform of

$$X[z]=\frac{2z^2}{(z-1)(z-2)^2};\quad 1<|z|<2$$

(03)

5C. Determine the Z-transform of the time signal $x[n]$ using the properties of Z-transform. Also determine the region of convergence.

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

(03)

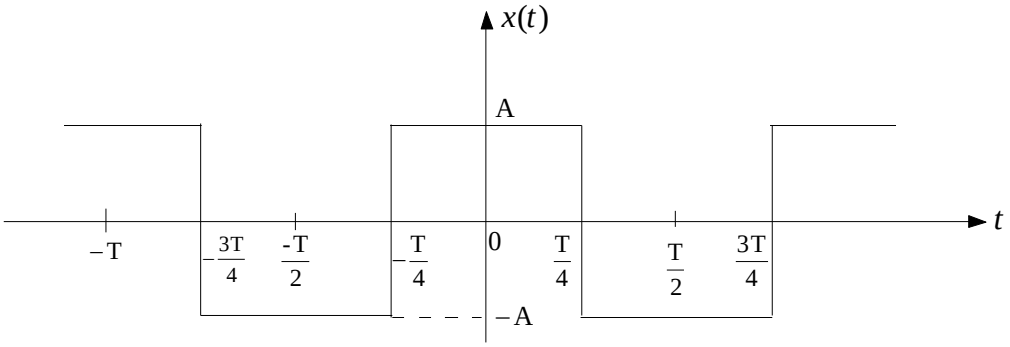

Fig.Q3A