Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKE UP EXAMINATIONS, JANUARY 2016

SUBJECT: SIGNALS AND SYSTEMS [ELE 202]

REVISED CREDIT SYSTEM

Time: 3 Hours | 12 JANUARY 2016 | MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.
- Table of Transform may be supplied.

1A. Given the sequence $x(n)=\{-2,1,\underset{\uparrow}{3},1,-1,-2\}$, sketch and label the following

(i) $x(2n-1)$; (ii) $x(2-n)$; (iii) $x(n^3)$ (03)

1B. Check whether the following signals are periodic, if periodic determine the fundamental period.

(i) $x(n)=1+e^{j\frac{4\pi n}{5}}-e^{-j\frac{2\pi n}{3}}$ (ii) $x(t)=2\cos\left(\frac{\pi}{6}t\right)+\sin\left(\frac{\pi}{8}t+\frac{\pi}{3}\right)-2\cos\left(\frac{\pi}{2}t\right)$ (03)

1C. Determine the system response $y[n]=x[n]*h[n]$ using convolution sum if input to the LTI discrete time system is $x[n]=\begin{cases}1 & ;\ for\ \ 0\le n\le 3\\ 0 & ;\ otherwise\end{cases}$ and

has impulse response $h[n]=\alpha^n u[n];\ |\alpha|<1$ (04)

2A. Find the continuous Convolution integral for the signals $y(t)=x(t)*h(t)$; where $x(t)=u(t+3)-u(t-1)$ and $h(t)=u(-t+3)$ and also plot $y(t)$. (04)

2B. Determine whether the given signal is energy or power signal? Also determine the energy and power of the signal.

(ii) $x(n)=e^{j\left(\frac{3}{7}\pi n+\frac{\pi}{4}\right)}$ (ii) $x(t)$ shown in Fig.Q 2B (ii) (04)

2C. Determine whether the system represented by the following input-output relations are (i) linear (ii) time invariant.

(a) $y[n]=3x[n]+5$, (b) $y(t)=x(2t)$ (02)

3A. Determine the over-all impulse responses of LTI system shown in Fig. Q.3A. Given that

$h_1[n]=\delta[n]-a\delta[n-1];\ h_2[n]=a^n u[n]$ and $h_3[n]=\left(\frac{1}{2}\right)^n u[n]$ (03)

3B. Find the natural and forced response of linear time invariant discrete-time system described by difference equation.

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

Do not use Z-transform metod. (07)

4A. Findthe exponential Fourier series of the waveform shown in Fig.Q4A. From the result obtained sketch the line spectrum and determine the trigonometric Fourier coefficient. (06)

4B. Using appropriate Fourier transform properties find the Fourier transform of

$$x(t)=\frac{d}{dt}\left\{te^{(-t+1)}\right\}u(t-2)$$

(04)

5A. Given the discrete time signal, $x[n]=\left\{\ldots\ldots,1,\ 2,-1,\ 0,\ 0,\ 1,\ \underset{\uparrow}{2},-1,\ 0,\ 0,\ 1,\ 2,-1,\ 0,\ 0,\ldots\ldots\right\}$,

find DTFS coefficients. (04)

5B. Find inverse DTFT of $\left|X\left(e^{j\Omega}\right)\right|=\begin{cases}1\ ;\ \dfrac{\pi}{2}<|\Omega|<\pi \\ 0\ ;\ otherwise\end{cases}$ and $Arg\left\{X\left(e^{j\Omega}\right)\right\}=-4\Omega$ (06)

6A. Determine Z-transform of the signals $x[n]$ using properties and find ROC

(i) $x[n]=n\left\{\left(\frac{1}{2}\right)^{n}u[n]*\left(\frac{1}{2}\right)^{n}\right\}$, (ii) $x[n]=\sin\left(\frac{\pi}{8}n-\frac{\pi}{4}\right)u[n-2]$ (05)

6B. Find the inverse Z-transform using

(i)Power series expansion

$$X(z)=\frac{z^{3}-z^{2}+z-\frac{1}{16}}{z^{3}-\frac{4}{5}z^{2}+\frac{1}{2}z-\frac{1}{16}};\ \text{ROC: } |z|>\frac{1}{2}$$

(ii)Partial fraction expansion

$$X(z)=\frac{\frac{1}{4}z^{-1}}{\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{1}{4}z^{-1}\right)}\ ;\ \text{ROC: } |z|>\frac{1}{2}$$

(05)

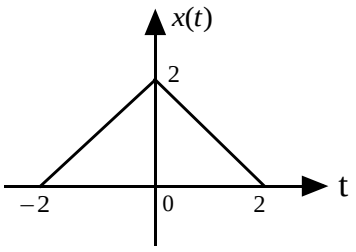

Fig.Q2B(ii)

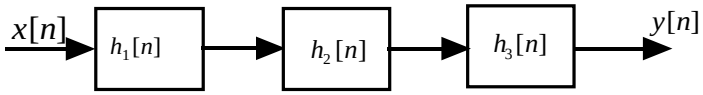

Fig.Q.3A

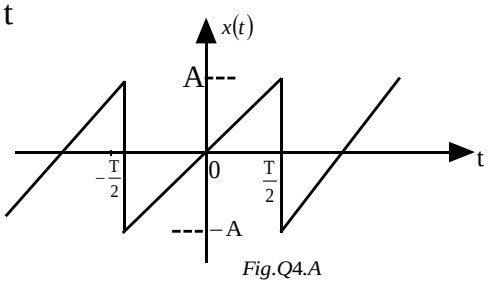

Fig.Q4.A