Reg. No. | | | | | | | | | |

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKEUP EXAMINATIONS, JUNE 2016

SUBJECT: SIGNALS AND SYSTEMS [ELE 2201]

REVISED CREDIT SYSTEM

Time: 3 Hours | 30 JUNE 2016 | MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data if any may be suitable assumed.
- Transform Table may be supplied

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

(i) $x[2n]$; (ii) $x[2-n]$; (iii) $x[3n+1]$ ***(03)***

1B. If the input to an LTI system is $x[n] = 1 \;\; for \;\; 3 \le n \le 6$ and its impulse response is $h[n] = \alpha^n u[n]$, determine the response of the system $y[n] = x[n] * h[n]$ using convolution sum. $|\alpha| < 1$ ***(04)***

1C. (i) Find whether the following signals is periodic. If periodic find its fundamental period. $x[n] = 2e^{j\frac{3\pi}{5}\left(n+\frac{1}{2}\right)}$ (ii) Determine whether the continuous-time signal $x(t) = tu(t)$ is energy or power signal or neither. ***(03)***

2A. Determine whether the system represented by input-output relation is (i) causal (ii) time-invariant. Justify the answer.

(i) $y[n] = n\,x[n]$ (ii) $y(t) = x(2t)$ ***(03)***

2B. A discrete-time LTI system is described by the following difference equation.

$$y[n] + \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = x[n] + x[n-1];$$

Given: $y[-1] = 1$ and $y[-2] = -1$ and input $x[n] = \left(\frac{1}{2}\right)^n u[n]$.

Using time domain method obtain (i) the Zero-input response (ii) Zero-state response. ***(07)***

3A. Using defining equation find the time domain signal $x(t)$ corresponding to continuous-time Fourier Transform(CTFT) representation given as:

$$X(j\omega) = \begin{cases} \cos\left(\frac{\omega}{2}\right) + j\sin\left(\frac{\omega}{2}\right); & |\omega| \le \pi \\ 0 \; ; & otherwise \end{cases}$$

(04)

3B. Find the Exponential Fourier coefficient of the wave form shown in Fig. Q3B. ***(04)***

3C. Determine the continuous time Fourier transform of the signal using properties. $x(t) = te^{-2t}u(t)$ ***(02)***

4A. Obtain the time-domain signal $x[n]$ corresponding to the DTFT representation

$$|X(e^{j\Omega})| = \begin{cases} 1 \; ; & \frac{\pi}{2} \le |\Omega| \le \pi \\ 0 \; ; & otherwise \end{cases} \quad \text{and} \quad \angle\{X(e^{j\Omega})\} = -4\Omega$$

(04)

4B. Find discrete-time periodic signal $x[n]$ if its DTFS co-efficient is given by

$$X[k] = \cos\left(\frac{6\pi}{17}k\right)$$

(03)

4C. If the DTFT of $x[n] = n\left(\frac{-3}{2}\right)^n u[n]$ is $X(e^{j\Omega})$, without evaluating $X(e^{j\Omega})$ find $y[n]$ in each of the following.

(i) $Y(e^{j\Omega}) = e^{-j2\Omega}X(e^{j\Omega})$ (ii) $\frac{d}{d\Omega}\{e^{j2\Omega}X(e^{j\Omega})\}$ ***(03)***

5A. Find the DTFT of non -periodic signal $x[n]$ using properties

$$x[n] = \left(\frac{\sin\left(\frac{\pi(n)}{4}\right)}{\pi n}\right) * \left(\frac{\sin\left(\frac{\pi(n-2)}{4}\right)}{\pi(n-2)}\right)$$. Also plot magnitude and phase spectra.

(04)

5B. Find the inverse Z- transform of $X(z) = \frac{z+2}{z^2+z+1}$; $|z| > 1$ ***(03)***

5C. Determine the Z- transform of the signal $x[n]$ using properties and also find the region of convergence.

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

(03)

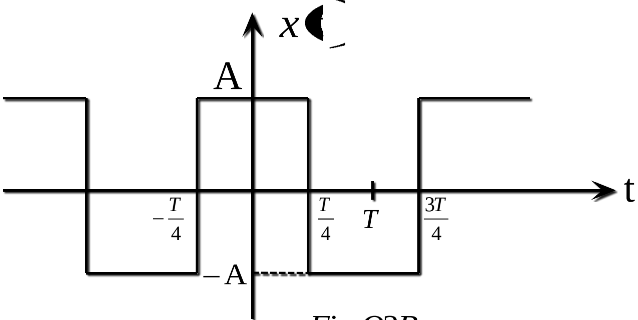

Fig.Q3B