Reg. No.										

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Manipal
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Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

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MANIPAL INSTITUTE OF TECHNOLOGY

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, MAY 2016

SUBJECT: SIGNALS AND SYSTEMS [ELE 2201]

REVISED CREDIT SYSTEM

Time: 3 Hours | 07 MAY 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. A continuous-time aperiodic signal $x(t)$ is shown in Fig. Q 1A, sketch and label the following (i) $x(-2t)$; (ii) $x\left(-\frac{2}{3}t-1\right)$; (iii) $x\left(\frac{1}{2}t\right)\delta(t-1)$ ***(03)***

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

$$x[n]=e^{\frac{-n}{10}}\sin\left(\frac{2\pi}{4}n\right)u[n]$$ ***(03)***

1C. Find the response $y[n]=x[n]*h[n]$ using convolution sum,

Where $x[n]=u[n]-u[n-4]$ and $h[n]=\alpha^n\{u[n]-u[n-6]\};|\alpha|<1$ ***(04)***

2A. (i) Check whether the following signal is periodic. If periodic determine the fundamental period. $x(t)=\cos^2\left(3t+\frac{\pi}{4}\right)-\sin\left(5t-\frac{\pi}{8}\right)+\cos\left(\frac{2}{3}t+\frac{\pi}{3}\right)$

(ii) For the given impulse response of an LTI system, check whether the system is memoryless, causal and /or stable. Justify the answer. $h(t)=e^{2t}u(1-t)$ ***(03)***

2B. Determine the step response of an LTI system whose impulse response $h(t)$ is depicted in Fig. Q 2B. ***(03)***

2C. Using time domain method obtain the forced response of an LTI system described by the difference equation:

$y[n]+\frac{1}{4}y[n-1]+\frac{1}{8}y[n-2]=x[n]+x[n-1]$. Given: $y[-1]=4$, $y[-2]=-2$

$$x[n]=\left(\frac{1}{4}\right)^n u[n]$$ ***(04)***

3A. Find the exponential Fourier coefficient of a periodic continuous-time signal

$$x(t) = \sum_{m=-\infty}^{\infty} \left[\delta\left(t - \frac{1}{2}m\right) + \delta\left(t - \frac{3}{2}m\right) \right]$$

(03)

3B. Using defining equation find the time domain signal $x(t)$ for given magnitude and phase spectra of aperiodic continuous -time signal $x(t)$ as

$$|X(jw)| = \begin{cases} 1\ ; & |\omega| \le 3 \\ 0\ ; & otherwise \end{cases} \text{ and } \angle X(j\omega) = -\frac{3}{2}\omega + \pi$$

(04)

3C. Determine the continuous time Fourier transform of the signal using properties.

$$x(t) = e^{-2t+3}\, u\left(\frac{t-6}{2}\right)$$

(03)

4A. Using the defining equation for DTFS evaluate the DTFS coefficients for discrete-time signal $x[n] = 2 + \sin\left(\frac{4\pi}{23}n\right) + \cos\left(\frac{8\pi}{23}n\right)$. Also plot the magnitude and phase spectra.

(03)

4B. Obtain the time-domain signal $x[n]$ corresponding to the Fourier representation given as $X\left(e^{j\Omega}\right) = \cos\Omega + j\sin\Omega$ using defining equation and hence plot the sequence $x[n]$.

(04)

4C. A discrete time non periodic signal is given by,

$x[n] = \{1, 0, 1, 2, 1, 0, 1, 2, 1, 0, -1\}$; Evaluate the following.

(i) $X\left(e^{j0}\right)$; (ii) $\int_{-\pi}^{\pi} X(e^{j\Omega})\, d\Omega$; (iii) $\int_{-\pi}^{\pi} |X(e^{j\Omega})|^2\, d\Omega$

(03)

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

$$x[n] = \left(\frac{\sin\left(\frac{\pi(n-1)}{5}\right)}{\pi(n-1)} \right) \cos\left(\frac{7\pi}{2}n\right)$$

(03)

5B. Determine the Z- transform of the signal $x[n]$ using properties and also find the region of convergence. $x[n] = n\sin(\frac{\pi}{2}n)u[-n]$

(04)

5C. Find the inverse Z- transform of $X(z) = \dfrac{1 - \frac{1}{3}z^{-1}}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{4}z^{-1}\right)(-z^{-1})}$; $\frac{1}{2} < |z| < 1$

(03)

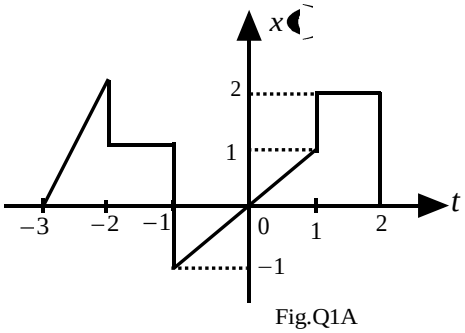

Fig.Q1A

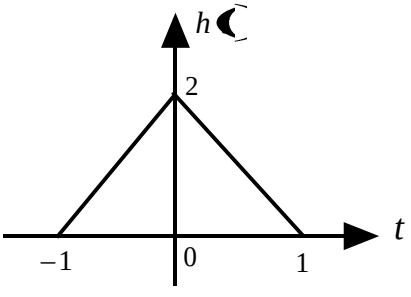

Fig.Q2B