Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKE-UP EXAMINATIONS, JUNE 2019

SIGNALS AND SYSTEMS [ELE 2201]

REVISED CREDIT SYSTEM

Time: 3 Hours **11 JUNE 2019** **Max. Marks: 50**

Instructions to Candidates:

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

1A. A discrete- time signal x[n] is defined as $x[n]=\{1, -1, \underset{\uparrow}{1}, 1, -1, 1, 2\}$ (0)

Plot (i) $x(\frac{2}{3}n-1)$, (ii) $x(2n)$, (iii) $x(3n+1)$, (iv) $\left(x(\frac{1}{2}n-3)*\delta(n-2)\right)+\cos(3\pi n)$ ***(04)***

1B. Determine whether the signal shown in Fig Q1B is energy or power signal. Also determine energy and power of signal.

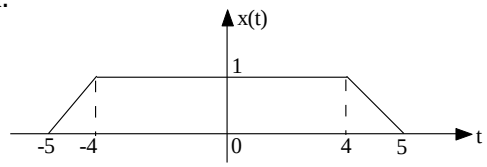

Fig.Q1B ***(03)***

1C. Determine whether or not each of the following signals is periodic. If the signal is periodic determine its fundamental period.

i. $x(n)=\cos\left(\frac{n\pi}{3}\right)-\cos\left(\frac{n\pi}{6}\right)+3\sin\left(\frac{n\pi}{4}+\frac{\pi}{6}\right)$

ii. $x(n)=\sum_{k=-\infty}^{\infty}\{\delta[n-3k]-\delta[n-2-3k]\}$ ***(03)***

2A. Evaluate $y(t)=x_1(t)*x_2(t)$;
where $x_1(t)=u(t+2)-u(t-2)$ and $x_2(t)=u(-t)-2u(-t-2)$ ***(04)***

2B. The impulse response of the system is given below. Determine whether the given system is causal, stable and memory less.

(i) $h(t)=e^{-3|t|}$ (ii) $h[n]=\cos(\frac{\pi}{4}n)[u(n)-u(n-8)]$ ***(03)***

2C. Evaluate $y(n)=x(n)*h(n)$

where $x(n)=\left(\frac{1}{3}\right)^n u(n-1)$ and $h(n)=u(n)-u(n-10)$ ***(03)***

3A. Consider the periodic square wave x(t) as shown in Fig Q3A. Determine the complex exponential Fourier series of x(t)

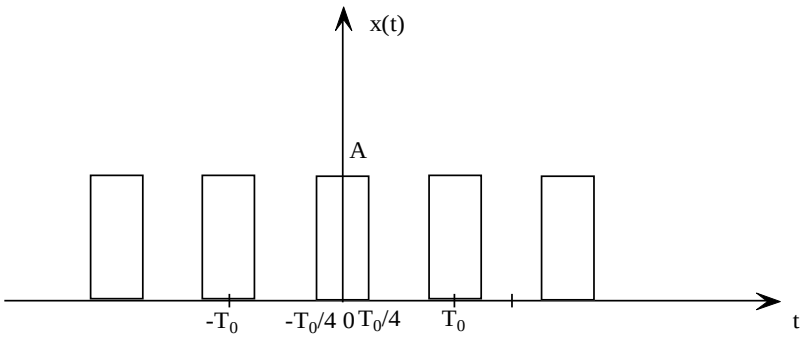

Fig Q3A

(03)

3B. Evaluate the total response for a system described by the following difference equation

$$y(n)+0.25y(n-1)-0.125y(n-2)=x(n)+x(n-1)$$

where $x[n]=(0.5)^n u[n]; \quad y(-1)=4, y(-2)=1$ ***(04)***

3C. Using properties, find the FT of $x(t)=\left[\frac{2\sin(3\pi t)}{\pi t}\right]\left[\frac{\sin(2\pi t)}{\pi t}\right]$ ***(03)***

4A. Using the defining equation for DTFS coefficients evaluate the DTFS representation for the following signal and also sketch the magnitude and phase spectra.

$x[n]=\sin(\frac{6\pi}{17}n+\frac{\pi}{3})$ ***(03)***

4B. Let x(n) be sequence x(n) = {3, 0, 1, -2, **-3**, 4, 1, 0, -1} with DTFT $X(e^{j\Omega})$. Evaluate the following functions of $X(e^{j\Omega})$ without computing $X(e^{j\Omega})$

(i) $X(e^{j0})$ (ii) $\int_{-\pi}^{\pi}|X(e^{j\Omega})|^2 d\Omega$ (iii) $\int_{-\pi}^{\pi}X(e^{j\Omega})d\Omega$ ***(03)***

4C. If the DTFT of $x(n)=n\left(\frac{-5}{3}\right)^n u(n)$ is $X(e^{j\Omega})$, without evaluating $X(e^{j\Omega})$, find $y(n)$ in each of the following.

i. $Y(e^{j\Omega})=e^{-j3\Omega}X(e^{j\Omega})$

ii. $Y(e^{j\Omega})=\frac{d}{d\Omega}\left\{e^{-j3\Omega}\left[X\left[e^{j\left(\Omega+\frac{\pi}{6}\right)}\right]-X\left[e^{j\left(\Omega-\frac{\pi}{6}\right)}\right]\right]\right\}$ ***(04)***

5A. Find the Z–Transform of x(n) using properties of z transform.

i) $x[n]=(n-1)\left(\frac{1}{4}\right)^n u[n]+\left(\frac{1}{2}\right)^n u[n-1]$

ii) $x(n)=Sin(\frac{\pi}{4}n)\left(\frac{1}{4}\right)^n u(n-1)$ ***(05)***

5B. Determine (i) transfer function and (ii) impulse response representation of the causal system described by the following difference equation.

$$y(n)-\frac{4}{5}y(n-1)-\frac{16}{25}y(n-2)=2x(n)+x(n-1)$$ ***(05)***