Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FOURTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER DEGREE EXAMINATIONS, JUNE - 2018

SUBJECT: SIGNALS & SYSTEMS [ICE 2201]

Duration: 3 Hour Max. Marks:50

Instructions to Candidates:

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

1A From the given signal $a(t)$ in Fig.Q 1A, sketch the following signals: 3

i) $p(t) = \frac{da(t)}{dt}$ ii) $q(t) = a(t)u(2-t)$

1B Determine whether the signal $x[n] = \cos\left(\frac{\pi n^2}{7}\right)$ is periodic or not. If periodic find the fundamental period. 2

1C Split the signal $y[n] = 0.2^n u[n-3]$ into even and odd parts. 2

1D Test for linearity, time invariance and causality for the following systems, 3

i) $y(t) = x^2(t) + 2x(t+1)$ ii) $y[n] = round\{x[n]\}$

2A A LTI system has an output $r(t) - 2r(t-1) + r(t-2)$ for a input $u(t) - u(t-1)$. Determine the output of the system for the input $x(t) = u(t) - u(t-2)$. 2

2B The impulse response of two systems are $h_1[n] = h_2[n] = u[n] - u[n-2]$ and are connected in cascade, determine the impulse response of the cascaded system. 3

2C Perform the convolution of the signals shown in Fig.Q 2C and sketch the resultant signal. 5

3A Consider continuous time LTI system whose step response is given by $s(t) = e^{-t}u(t)$. Determine and sketch the output of the system for the input $x1(t)$ shown in Fig.Q 3A. 2

3B Draw direct form I and direct form II implementations for difference equation. 3

$$y[n] + \frac{1}{2}y[n-1] + \frac{1}{4}y[n-2] = 2x[n] + 6x[n-1]$$

3C Determine the complete response of the system described by the second order differential equation $\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 3y(t) = e^{-2t}$, with initial conditions $y(0) = 1; \dot{y}(0) = 0$. 5

4A State time-shift and modulation property of Fourier transform. 2

4B If $x[n] = \left(\frac{1}{3}\right)^n u[n]$, then determine IDTFT of $X^2(e^{j\Omega})$. 3

4C Find the FT of the function shown in Fig.Q 4C, by using properties and linear combination of rectangular and triangular functions. 5

5A Evaluate appropriate Fourier coefficients for the signal

$$x[n] = 1 + cos\left(\frac{10\pi}{21}n\right) + sin\left(\frac{4\pi}{21}n\right)$$ 2

5B Consider a system with a frequency response$H(e^{j\Omega})$, produces an output $y[n] = \delta[n] - \delta[n-1] - 2\delta[n-3]$ for an input $x[n]$ = {1, 0.5}. Find $h[n]$ and $H\left(e^{j\Omega}\right)$. 3

5C Explain the sampling theorem and derive the expression for ideal bandlimited interpolation operation. 5

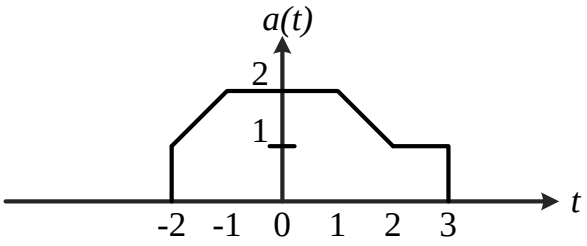

Fig.Q 1A

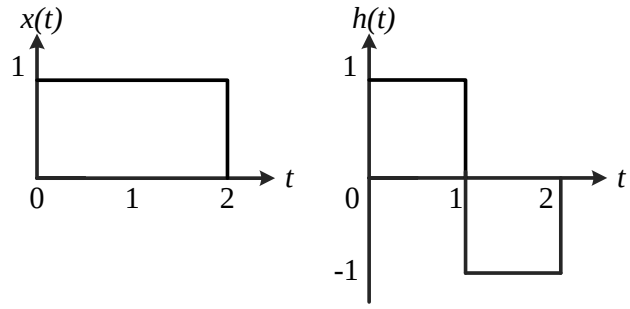

Fig. Q 2C

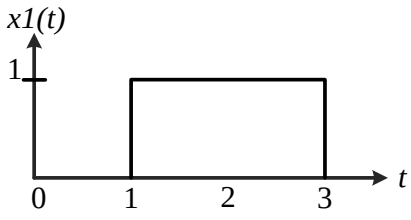

Fig.Q 3A

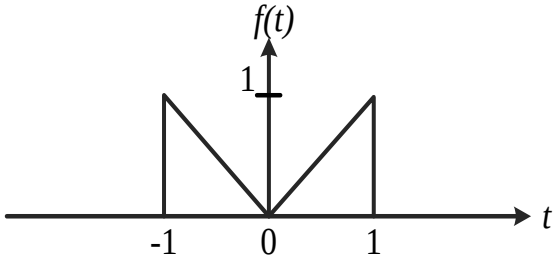

Fig.Q 4C