Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

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

END SEMESTER EXAMINATIONS, APRIL - 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 A system has input output relationship given by $y[n] = x^2[n]$. Test the system for time invariance and linearity. 2

1B Determine whether the following signal x[n] is periodic. If it is periodic, determine its fundamental period. 3

$$x[n] = Cos(\frac{\pi n}{4}) + Sin\,(\frac{\pi n}{8}) - 2\,Cos(\frac{\pi n}{2})$$

1C With the help of an example for each, explain the different classes of signals. 5

2A Let $x(n) = 2^n\,[u(n+1) - u(n-4)], sketch\; y(n) = x(-n-2)$ 2

2B A system is formed by connecting two systems in parallel. The impulse response of the systems is given by $h1(t) = e^{-2t}u(t)$ and $h2(t) = 2e^{-t}u(t)$. Find the overall impulse response of the system and test the system for stability. 3

2C The input x(t) and the impulse response h(t) of the LTI system are given: 5
$x(t) = 2u(t-1) - 2u(t-3), h(t) = u(t+1) - 2u(t-1) + u(t-3)$
Find the output of the system.

3A Given, the impulse response of the LTI system, $h(t) = 2\delta(t) + \delta(t-5)$, determine whether the system is (i) memoryless (ii) Causal (iii) stable. 2

3B Draw the DF-I and DF-II structures for the following difference equation of the system: 3
$y[n] + ½y[n-1] - ¾y[n-3] = x[n] + 2x[n-2]$

3C Determine the complete response for the following system, 5
$\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 4y(t) = 2e^{-2t}u(t) \quad with\; y(0) = 0,\; \frac{dy(t)}{dt}\Big|_{t=0} = 1$

4A Determine the Fourier coefficients for the following signal: 2

$$x(t) = Cos(4t) + Sin(6t)$$

4B Given the signal $x[n] = ne^{jn\pi/8}\,\boldsymbol{\alpha}^{n-3}u(n-3)$, find the suitable Fourier representation using the properties. 3

4C An LTI system has the impulse response $h(t) = \frac{Sin\,(2\pi t)}{\pi t}$Cos (7 πt). Determine the system output if the input is $x(t) = Cos(2\pi t) + \sin(6\pi t)$. 5

5A Determine the suitable Fourier representation for the given signal $x(t) = e^{-a|t|}$, a >0. 2

5B Determine the time domain signal given the following Fourier representation: 3

$$X(j\omega) = \frac{5j\omega + 12}{(j\omega)^2 + 5j\omega + 6}$$

5C With neat diagram explain the scheme for practical reconstruction system for Continuous time signal from samples. 5

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