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

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

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

END SEMESTER DEGREE EXAMINATION, JUNE - 2019

SUBJECT: SIGNALS & SYSTEMS [ICE 2201]

TIME: 3 HOURS MAX. MARKS: 50

Instructions to candidates :*Answer ALL questions and missing data may be suitably assumed.*

1A Two signals $x(t)$ and $h(t)$ are related by $x(t) = h(5 - 3t)$. Given the signal $x(t)$ as shown in Fig.Q1A, determine the signal $h(t)$.

1B Test for linearity, causality and time invariance of the system governed by the input-output relationship given by, y[n]=x[an]; a≠1.

1C Determine $z[n]=x_{even}[n]+y_{even}[n]$ if, $x[n] = \{0, \underset{\uparrow}{-1}, 1, 2, 4\}$ and $y[n] = \{-2, 1, \underset{\uparrow}{1}, 0, -3\}$.

(3+3+4)

2A If the discrete time signal e^{an} is periodic, determine the condition under which this is true.

2B Given x(t)=5Sin 24**π**t+7Sin 36 **π**t , test whether the given signal is periodic or not. If periodic, find its fundamental period.

2C The input $x(t)$ and impulse response $h(t)$ of a LTI system are given by, $x(t) = 2u(t-1) - 2u(t-3)$ *and* $h(t) = u(t+1) - 2u(t-1) + u(t-3)$. Determine and sketch the output of the system.

(2+3+5)

3A The step response of a discrete-time LTI system is given by, $s[n] = a^n u[n], 0 < a < 1$. Find the impulse response of the system.

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

$$y[n] + \frac{1}{2}y[n-2] - \frac{1}{2}y[n-3] = 2x[n] + 6x[n-2]$$

3C Determine the complete response of the system described by the second order differential equation, $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = x(t) + \frac{dx(t)}{dt}$, The input of the system is $x(t) = \sin(2t)\,u(t)$ with initial conditions $y(0) = 0; \dot{y}(0) = 0$.

(2+3+5)

4A Determine the suitable Fourier representation for $x(t) = e^{-2t}[u(t-1)]$.

4B Consider a periodic waveform $x(t) = 4 + 2\cos(3t) + 3\sin(4t)$

i) Find complex Fourier coefficients.

ii) Using Parseval's theorem find power spectrum.

4C Find the input of the system given the impulse response $h[n] = (½)^n u[n]$ and system output $y[n] = 4(½)^n u[n]$

(2+4+4)

5A Consider a signal $x(t)$ with the spectrum $X(j\omega)$ as shown in Fig.Q5A. Sketch the spectrum of the signal $p(t) = x(t)\{\cos\left(\frac{1}{2}t\right) + \cos(\frac{3}{2}t)\}$.

5B State convolution, modulation and frequency shift property of Fourier series.

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

(2+3+5)

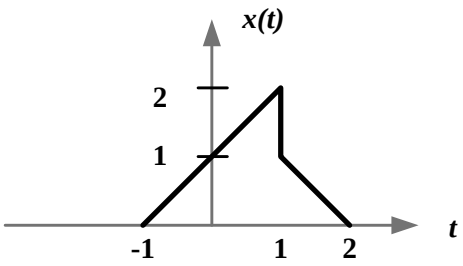

Fig.Q1A

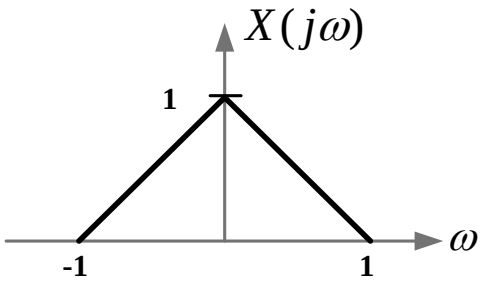

Fig.Q5A

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