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, APRIL/MAY - 2019

SUBJECT: SIGNALS AND SYSTEMS [ICE 2201]

TIME: 3 HOURS MAX. MARKS: 50

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

1A Test the system y[n] = x^2[n] for linearity and memory.

1B Given $x[n] = 2^n[u[n+1] - u[n-4]]$, plot the signal x [-n-1].

1C With the help of an example for each, explain the classification of signals.

(2+3+5)

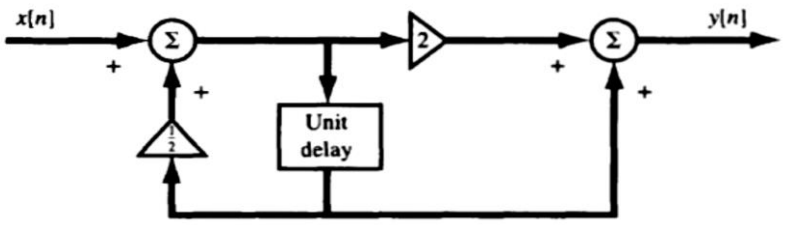
2A Evaluate the step response of the system whose impulse response is $h[n] = (½)^n u[n]$.

2B Two systems are in cascade. The impulse response of the first unit is $h_1[n] = (0.5)^n u[n]$, while that of the second is $h_2[n] = \{1, -0.5\}$, determine the output of the cascaded system if the input is $x[n] = \cos(5n) - 2\sin(7n)$.

2C Evaluate the output of the system given the input $x(t) = e^{-3t}[u(t) - u(t-2)]$ and the impulse response $h(t) = e^{-t}[u(t)]$.

(2+3+5)

3A Write the difference equation for the following block diagram.



3B Draw the direct form-I and direct form-II implementations for the system defined by the difference equation:
y[n]+(1/6) y[n-1]+ (1/8) y[n-3]= x[n]-x[n-2]

3C Find the complete response of the system described by the following differential equation:
$\frac{d^2y(t)}{dt^2} + 7\frac{dy(t)}{dt} + 6y(t) = \frac{dx(t)}{dt}$ $with\ y(0) = 0,\ \frac{dy(t)}{dt}\Big|_{t=0} = 1$; The input $x(t) = e^{-2t}[u(t)]$.

(2+3+5)

4A Determine DTFS of $x[n] = cos^2(\frac{\pi}{8}n)$.

4B State convolution, modulation and frequency shift property of DTFT.

4C Determine $y(t) = x(t) * h(t)$, for the given signals

$$x(t) = \frac{\cos(95t)\sin(7t)}{\pi t} \quad and \quad h(t) = \frac{\cos(100t)\sin(6t)}{\pi t}$$

Also sketch $X(j\omega), H(j\omega), and\ Y(j\omega)$.

(2+3+5)

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 Find the time domain signal x(t), for the given Fourier representation $X(j\omega) = \frac{5j\omega+12}{(j\omega)^2+5j\omega+6}$.

5C Explain the sampling theorem and reconstruction of CT signals using samples with the help of zero-order hold.

(2+3+5)

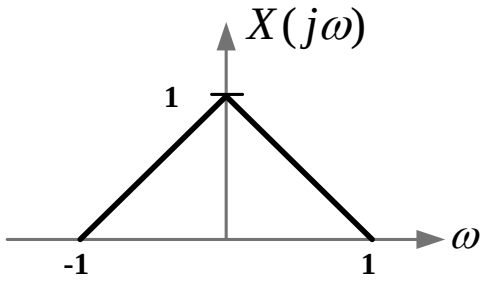


Fig.Q5A

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