

15. (a) (i) Realise the following system in cascade form (10)

$$H(z) = \frac{1 + \frac{1}{2}z^{-1}}{\left(1 - \frac{1}{2}z^{-1} + \frac{1}{3}z^{-2}\right)\left(1 + \frac{1}{4}z^{-1}\right)}$$

- (ii) Convolve $x(n) = \{1, 1, 0, 1, 1\}$ (6)

$$h(n) = \{1, -2, -3, 4\}$$

↑

↑

OR

- (b) A system is governed by a linear constant coefficient difference equation
 $y(n] = 0.7y[n-1] - 0.1y[n-2] + 2x[n] - x[n-2]$
 Find the output response of the system $y(n)$ for an input $x(n) = u(n)$ (16)

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B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Third Semester

Electronics and Communication Engineering

EC 6303 - SIGNALS AND SYSTEMS

(Common to Biomedical Engineering and Medical Electronics Engineering)

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART - A (10 × 2 = 20 Marks)

- Sketch the following signals :
 $\text{rect}\left(\frac{t+1}{4}\right)$; 5 ramp (0,1)
- Given $g(n) = 2e^{-2n-3}$. Write out and simplify the functions
 (i) $g(2-n)$ (ii) $g\left(\frac{n}{10} + 4\right)$
- What is the inverse Fourier transform of
 (i) $e^{-j2\pi f_0}$ (ii) $\delta(t - t_0)$
- Give the Laplace Transform of $x(t) = 3e^{-2t}u(t) - 2e^{-t}u(t)$ with ROC.
- Find whether the following system whose impulse response is given is causal and stable $h(t) = e^{-2t}u(t-1)$.
- Realize the block diagram representing the system $H(s) = \frac{s}{s+1}$.
- Write the conditions for existence of DTFT.

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8. Find the final value of the given signal

$$X(z) = \frac{1}{1 + 2z^{-1} + 3z^{-2}}$$

9. From discrete convolution sum, find the step response in terms of $h(n)$.
 10. Define the non recursive system.

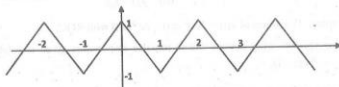
PART - B (5 × 16 = 80 Marks)

11. (a) (i) Find whether the following signals are periodic or aperiodic. If periodic find the fundamental period and fundamental frequency
 $x_1(n) = \sin 2\pi n + \cos \pi n$ (8)
 $x_2(n) = \sin \frac{n\pi}{3} \cos \frac{n\pi}{5}$ (8)
 (ii) Find whether the following signals are power or energy signals. Determine power and energy of the signals. (8)
 $g(t) = 5 \cos\left(17\pi t + \frac{\pi}{4}\right) + 2 \sin\left(19\pi t + \frac{\pi}{3}\right)$
 $g(n) = (0.5)^n u(n)$

OR

- (b) Find whether the following systems are time variant or fixed. Also find whether the systems are linear or nonlinear
 $\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 5y(t) = x(t)$ (8)
 $y(n) = an^2x(n) + bn \times (n-2)$ (8)

12. (a) Obtain the Fourier series coefficients & Plot the spectrum for the given waveform (16)



OR

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- (b) (i) From basic formula, determine the Fourier transform of the given signals. Obtain the magnitude and phase spectra of the given signals. (5 + 5)
 $te^{-a}u(t)$, $a > 0$
 e^{-at} , $a > 0$
 (ii) State and prove Rayleigh's energy theorem. (6)

13. (a) (i) Using graphical convolution, find the response of the system whose impulse response is
 $h(t) = e^{-2t}u(t)$ (8)
 for an input $x(t) = \begin{cases} A, & \text{for } 0 \leq t \leq 2 \\ 0, & \text{otherwise} \end{cases}$

- (ii) Realize the following in indirect form II. (8)

$$\frac{d^3y(t)}{dt^3} + 4\frac{d^2y(t)}{dt^2} + 7\frac{dy(t)}{dt} + 8y(t) = 5\frac{d^2x(t)}{dt^2} + 4\frac{dx(t)}{dt} + 7x(t)$$

OR

- (b) (i) An LTI system is defined by the differential equation (10)
 $\frac{d^2y(t)}{dt^2} - 4\frac{dy(t)}{dt} + 5y(t) = 5x(t)$

Find the response of the system $y(t)$ for an input $x(t) = u(t)$, if the initial conditions are $y(0) = 1$; $\frac{dy(t)}{dt} \Big|_{t=0} = 2$.

- (ii) Determine frequency response and impulse response for the system described by the following differential equation. Assume zero initial conditions. (6)

$$\frac{dy(t)}{dt} + 3y(t) = x(t)$$

14. (a) (i) State and prove sampling theorem. (10)
 (ii) What is aliasing? Explain the steps to be taken to avoid aliasing. (6)

OR

- (b) State and prove the following theorems : (8)
 (i) Convolution theorem of DTFT (8)
 (ii) Initial value theorem of z-transform (8)

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