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Question Paper Code: 54404

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

Fourth Semester

Electronics and Communication Engineering

15UEC404- SIGNALS AND SYSTEMS

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The power of the energy signal is _____ over infinite time. CO1- R
(a) Zero (b) One (c) Infinite (d) None of the above
2. The total average power of the periodic signal $x(t)$ is equal to the average power of its phasor components is known as CO2- R
(a) Dirichlet condition (b) Parsevals power theorem
(c) Symmetry property (d) None of the above
3. The output of the system changes with respect to applied input is CO3- R
(a) Natural response (b) Forced response (c) either (a) or (b) (d) (a) and (b)
4. All causal systems must have the component of CO4- R
(a) Memory (b) Clock (c) Resistor (d) Linearity
5. Z-transform of $u(-n)$ is CO5- R
(a) $(1 - z)^{-1}$ (b) $(1 + z)^{-1}$ (c) $(1 - z)$ (d) $(1 + z)$

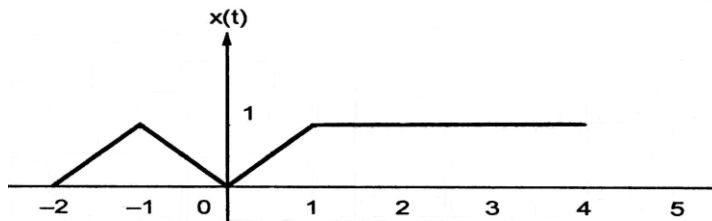
PART – B (5 x 3= 15Marks)

6. Define periodic and non-periodic signal with an example. CO1- R
7. If the discrete time signal $x[n] = \{0,0,0,3,2,1,-1,-7,6\}$ then find $y[n] = x[2n - 3]$. CO2- R
8. What is meant by recursive and non-recursive systems? CO3- R
9. State and prove time shifting property of DTFT. CO4- R
10. Given $y(n) = x(n) + \frac{1}{8}x(n - 1) + \frac{1}{3}x(n - 2)$. Find whether the system is stable or not. CO5- R

PART – C (5 x 16= 80Marks)

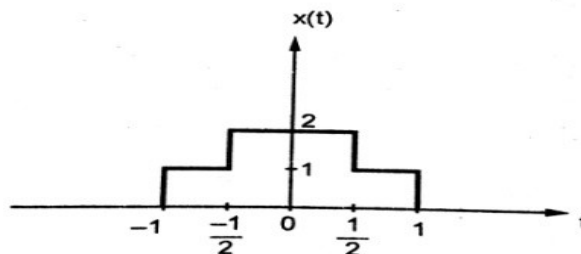
11. (a) (i) Define and plot the following signals CO1- App (4)
 1. Ramp 2. Step 3. Impulse 4. Exponential

- (ii) Find the even and odd parts of the signal $x(t)$ given below CO1- App (12)



Or

- (b) (i) Given $x(t)$. CO1- App (8)



- Sketch the following signals 1) $x(3t+2)$ 2) $x(-t/2 -1)$

- (ii) Given $y[n] = x[n] + nx[n + 1]$. Determine whether the system is causal, linear, time invariant and memory less. CO1- App (8)
12. (a) Find the Fourier series of the signal CO2- App (16)
 $x(t) = \int_0^{2\pi} \sin 2\pi f_0 m t \cos 2\pi f_0 n t dt$
 Where f_0 is the fundamental frequency and m and n are any positive integer
- Or
- (b) State and explain the following properties of Fourier Transform CO2 -Ana (16)
 i) Linearity
 ii) Differentiation and Integration
 iii) Convolution
 iv) Time shifting
13. (a) (i) Find the Laplace transform of CO3 -Ana (10)
 $x(t) = e^{-b|t|}$ for $b < 0$ and $b > 0$ (6)
- (ii) Find the inverse Laplace transform of
- $$x(s) = \frac{2s^2 + 9s - 47}{(s+1)(s^2 + 6s + 25)}$$
- Or
- (b) Find the convolution of $x(t)$ and $h(t)$ CO3- Ana (16)
 $x(t) = \begin{cases} 1 & ; 0 \leq t \leq 2 \\ 0 & ; otherwise \end{cases}$
 $h(t) = \begin{cases} 1 & ; 0 \leq t \leq 3 \\ 0 & ; otherwise \end{cases}$
14. (a) (i) Obtain the circular convolution of $x_1(n) = \{2,1,2,1\}$ and $x_2(n) = \{1,2,3,4\}$ CO4- App (8)
- (ii) Find DTFT of $x[n] = -a^n u[n - 1]$ for $|a| > 1$ CO4- App (8)
- Or
- (b) (i) State and prove any three properties of DTFT. CO4 -Ana (12)
- (ii) Find the linear convolution of CO4 -Ana (4)
 $x(n) = \{1,2,3,4\}$ and $h(n) = \{2,3,4,1\}$

15. (a) (i) State and prove convolution property of z-transform. CO5- App (8)

(ii) Find the inverse Z-transform of CO5- App (8)

$$X(z) = \frac{1}{1024} \left[\frac{1024 - z^{-10}}{1 - \frac{1}{2}z^{-1}} \right], \quad |z| > 0$$

Or

(b) Realize direct form-I and direct form-II realization of the discrete CO5-Ana (16)
time system having system function

$$H(z) = \frac{2(z + 2)}{z(z - 0.1)(z + 0.5)(z + 0.4)}$$