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Question Paper Code: 54404

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

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. Time shifting property mathematically can be expressed as CO1- R
(a) $y(t) = x(t-T)$ (b) $y(t) = x(t)$ (c) $y(t) = x(t) + 1$ (d) $y(t) = x(t) - 1$
2. A periodic signal $x(t)$ of period T_0 is given by $x(t) = \begin{cases} 1 & |t| < T_1 \\ 0 & T_1 < |t| < \frac{T_0}{2} \end{cases}$ CO2- R
The dc component of (t) is
(a) $\frac{T_1}{T_0}$ (b) $\frac{T_1}{2T_0}$ (c) $\frac{2T_1}{T_0}$ (d) $\frac{T_0}{T_1}$
3. The inverse Laplace transform of $\frac{-a}{s(s-a)}$ CO3- R
(a) e^{at} (b) $-e^{at}$ (c) $1 - e^{at}$ (d) $-1 + e^{at}$
4. The F.T. of a conjugate symmetric function is always CO4- R
(a) Imaginary (b) Real (c) Conjugate unsymmetric (d) Conjugate symmetric
5. The Region of Convergence(ROC) of the Z-transform of a unit step function is CO5- R
(a) $|z| < 1$ (b) (Real Part of Z) > 0 (c) (Real Part of Z) < 0 (d) $|z| > 1$

PART – B (5 x 3= 15 Marks)

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| 6. | Draw a graph and write the mathematical expression for unit parabolic function.. | CO1- R |
| 7. | What is the difference between tabulation and graphical methods? | CO2- R |
| 8. | What is meant by recursive and non-recursive systems? | CO3- R |
| 9. | Differentiate convolution and multiplication property. | CO4- R |
| 10. | Define system function. | CO5- R |

PART – C (5 x 16= 80 Marks)

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| 11. | (a) (i) Find the signal $x(n) = (1/3)^n u(n)$ is energy signal or not. | CO1- U | (6) |
| | (ii) Explain with supporting equations of energy and power signals. | CO1- App | (10) |

Or

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|---------|--|---------|-----|
| (b) (i) | What are the mathematical operations that can be performed on discrete time signals? | CO1 App | (8) |
| (ii) | Determine whether the following systems are time invariant or not. | CO1 App | (8) |
| | 1. $y(t)=2tx(t)$, | | |
| | 2. $y(t)= x(t)\sin 20\pi t$ | | |

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|-----|---|----------|------|
| 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

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| (b) | Determine the forced response of the system described by the equation | CO2- App | (16) |
|-----|---|----------|------|

$$5 \frac{dy(t)}{dt} + 10y(t) = 2x(t), \text{ for the input, } (t) = 2u(t)$$

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|-----|---|----------|------|
| 13. | (a) Explain and prove any five properties of Laplace transform | CO3- Ana | (16) |
| | Or | | |
| (b) | Find the Inverse Laplace transform of $X(S) = (2S+1) / (S+1)(S^2+2S+2)$. | CO3- Ana | (16) |

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|-----|---|--------|------|
| 14. | (a) Find the frequency response of a I order system described by difference equation $y(n) = a y(n-1) + x(n)$. Plot magnitude and phase response for $a = 0.5$. | CO4- U | (16) |
|-----|---|--------|------|

Or

(b) (i) Find the linear convolution of CO4- U (8)

$$x(n) = \{1,2,3,4\} \quad \text{and} \quad h(n) = \{2,3,4,1\}$$

(ii) Find the DTFT of the given periodic signal CO4- U (8)

$$x[n] = \cos \omega_0 n = \frac{1}{2} e^{j\omega_0 n} + \frac{1}{2} e^{-j\omega_0 n}, \text{ with } \omega_0 = \frac{2\pi}{3},$$

15. (a) List the properties of Z-transform and explain briefly. CO5- Ana (16)

Or

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

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

