Roll No. | | | | | | | | | | |

B.E / B.Tech (FT) END SEMESTER EXAMINATIONS – APRIL / MAY 2019

Electronics and Communication Engineering

Third Semester

EC8353 Signals and Systems

(Regulation 2012)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Verify the signal x(t) = sin(100t). u(t) is even or not.
2. State the condition for a system to be BIBO stable.
3. Identify a periodic signal for which Fourier series does not exist and justify.
4. Draw the ROC of the Laplace transform of a signal $x(t) = e^{t} u(-t)$.
5. Find the frequency response of a system described by y(t) = dx(t)/dt.
6. The ROC of transfer function of a continuous time system is given by |Re{s}| < 2. Comment on the stability of the system.
7. What is meant by aliasing and how can it be avoided?
8. State time shifting property of Z-transform.
9. Write the condition on impulse response h[n] of a LTI system to be causal.
10. Write advantage of direct form-II structure over direct form-I structure.

Part – B (5 x 16 = 80 marks)

11. Consider a stable LTI system is described by $\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = \frac{dx(t)}{dt} + x(t)$.
    (iv) Find its transfer function and impulse response (6)
    (v) Draw the ROC of the transfer function and comment on the causality of the system. (4)
    (vi) Find the output y(t) for the input $x(t) = e^{-t} u(t)$. (6)

12. a) (i) State the condition to classify a continuous time signal as periodic, even/odd, deterministic/random and energy/power. (8)
    (ii) Consider a signal $x(t) = e^{-2t} u(t)$. Draw its even part y(t) and the classify the signal y(t) as energy/power. (8)

    (OR)

    b) (i) State the conditions to classify a discrete time system as linear, time invariant, causal and stable. (8)
    (ii) Consider a system y[n] = x[n+1] – 1 / x[n-1]. Classify the system under linearity, time invariance, causality and stability. (8)

13. a) (i) State and prove convolution property of Fourier transform (8)
(ii) Find the Fourier transform of the signal $x(t) = [e^{-5t} u(t)] * [e^{5t} u(-t)]$ (8)

(OR)

b) (i) State and prove time shifting and frequency shifting properties of Laplace transform (8)
(ii) Find the Laplace transform of $x(t) = 3 \cos(100t) u(t) - 5 \sin(100t) u(t)$. Draw the ROC in s-plane. (8)

14. a) (i) State and prove conjugation and time reversal property of discrete time Fourier transform (8)
(ii) Find the Fourier transform of the signal $x[n] = a^n u[n]$. Using the properties find the DTFT of $y[n] = 2^n u[-n-1]$ and $y[-n]$. (8)

(OR)

b) (i) State and prove convolution property of Z-transform.
(ii) Find the z-transform the signal x[n] obtained by convolving $0.5^n u[n]$ with $u[n]$

15. a) Consider a stable LTI system is described by $y[n-2] - \frac{3}{4} y[n-1] + \frac{1}{8} y[n] = x[n] - x[n-1]$.
(i) Find its transfer function, draw the ROC of the transfer function and comment on the causality of the system. (6)
(ii) Find the step response of the system. (6)
(iii) Draw the direct form-II structure of the system. (4)

(OR)

b) Consider a stable LTI system produces an output $y[n] = (1/2)^n u[n]$ for an input $x[n] = u[n] - u[n-1]$.
(i) Draw the ROC of the transfer function of the system and comment on the causality of the system. (6)
(ii) Find the output of the system for an input $\delta[n]+(1/2)^n u[n]$. (10)