C 1268 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [14 SCHEME] DEGREE EXAMINATION, APRIL 2016

EC 14 403—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **eight** *questions.*

1. Consider the sinusoidal signal $x(t) = A\cos(\omega t + \Phi)$. Determine the average power of $x(t)$.
2. Evaluate the continuous-time convolution integral $y(t) = u(t+1) * u(t-2)$.
3. The impulse response of the system relating the input voltage to the voltage across the capacitor is given by $h(t) = \frac{1}{RC} e^{-t/RC} u(t)$. Find the expression for the frequency RC response.
4. Write down the exponential form of the Fourier Series representation of a periodic signal.
5. Represent the continuous time unit step and unit impulse signal.
6. State the time shifting and linearity property of Laplace Transform.
7. Define Nyquist rate and Nyquist interval.
8. Explain the linearity property of Laplace Transform.
9. How to relate the transfer function and difference equation ?
10. How to determine the stability of the system using z-transform ?

(8 × 5 = 40 marks)

Part B

11. (a) A linear time in-variant system may be casual or non-casual. Explain with an example for each one of these two possibilities.

Or

(b) Use the definition of the convolution sum to prove the following properties :

(i) Distributive : $x[n] * (h[n] + g[n]) = x[n] * h[n] + x[n] * g[n]$

(ii) Associate : $x[n] * (h[n] * g[n]) = (x[n] * h[n]) * g[n]$

(iii) Commutative : $x[n] * h[n] = h[n] * x[n]$.

Turn over

12. (a) Determine the Fourier Transform of the time-shifted rectangular pulse.

Or

(b) Explain Difference equation descriptions.

13. (a) Explain the Fourier representation of discrete time signals.

Or

(b) Given a system with an impulse response $h(t) = \frac{1}{2} e^{-2t} u(t)$. Determine whether the system is casual or not.

14. (a) Determine the z-transform for the following finite-duration sequences: (i) $x[n] = [1, 2, 3, 4, 7]$ and (ii) $x[n] = \delta[n]$.

Or

(b) Explain the properties of the Region of Convergence of z-transform.

(4 × 15 = 60 marks)