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Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2014

EC 09 304/PT EC 09 303—SIGNALS AND SYSTEMS

Time : Three Hours

Maximum : 70 Marks

Part A

Answer **all** *the questions.*
Each question carries 2 *marks.*

1. What is deterministic and random signals ?
2. What is the condition for the existence of Fourier transform ?
3. Define discrete-time Fourier transform.
4. What is meant by causality ?
5. State final value theorem of z-transform.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Derive the condition for BIBO stability of an LTI system.
7. Check whether the following signal is periodic or not. If it is periodic find its period.

$$x(t) = \cos(3\pi t) + e^{j\left(4\pi t + \pi/3\right)}.$$

8. State and prove time delay Property of Fourier transform.
9. Explain what is meant by aliasing ?
10. Find the DTFT of :

$$x(n) = \left(\frac{1}{3}\right)^{|n|}.$$

11. Explain the properties of ROC of z-transform.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*

12. (a) List the various properties of system and explain. (10 marks)

Or

(b) (i) Find the energy of the following signal :

$$x(t) = 5e^{-2t}, t \geq 0$$
$$= 0, \quad t < 0.$$

(3 marks)

(ii) Find the convolution of :

$$x(t) = e^{-t}\, u(t)$$
with $h(t) = u(t)$.

(7 marks)

13. (a) (i) Explain the reconstruction of analog signal from its samples. (6 marks)

(ii) Find the Hilbert transform of $x(t) = \cos(w_0 t)$ (4 marks)

Or

(b) Determine the energy at the output of the system having frequency response

$$H(w) = \frac{1}{1 + jw}$$

when the input to the system is

$$x(t) = \frac{\sin(2\pi Bt)}{2\pi Bt}, B > 0.$$

(10 marks)

14. (a) (1) Find the discrete Fourier Series representation of the periodic sequence

$$x(n) = \{1, 0, 1, 0\}$$

with period N = 4.

(5 marks)

(2) Explain the following :

(i) Inverse system.

(ii) Stability.

(3 + 2 = 5 marks)

Or

14. (b) Find the response of the system having differential

$$\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2\,y(t) = x(t)$$

for the input $x(t) = u(t)$.

(10 marks)

15. (a) (i) State and prove any *two* properties of z-transform. (5 marks)

(ii) If $X(z) = \dfrac{4z}{(z+2)^2}$ is the z-transform of $x(n)$, then find the z-transform of $nx(n)$.

(5 marks)

Or

(b) Find the impulse response of the system described by the difference equation $y(n) = \frac{5}{6}y(n-1) + \frac{1}{6}y(n-2) = x(n)$ using z-transform.

(10 marks)

(4 × 10 = 40 marks)