D 90155 (Pages : 2) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2015

AI 09 502—SIGNALS AND SYSTEMS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. What are the conditions for a system to be LTI system ?
2. Define convolution integral.
3. What is an anti-aliasing filter ?
4. What is the fourier transform of a DC signal of amplitude 1 ?
5. What is DTFT ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Discuss whether the signal $x(t) = \sin 20\pi t + \sin 5\pi t$ is periodic and if it is periodic find the fundamental period.
7. Explain energy, power spatial density of a signal.
8. State and Prove Parseval's theorem of fourier transform.
9. Draw and list the basic elements for the block diagram representation of continuous time system.
10. Describe Dirichlet's conditions.
11. Describe analysis equations of continuous time fourier transform.

(4 × 5 = 20 marks)

Part C

Answer Section (a) **or** *Section (b) of each question.*

12. (a) Determine whether the discrete time system $y(n) = x(n) \cos(\omega n)$ is : (i) Memoryless ; (ii) Stable (iii) Causal ; (iv) Linear ; and (v) Time invariant.

Or

(b) Determine the transfer function and impulse response for the causal LTI system described by the difference equation :

$y(n) - (1/4)\, Y(n-1) - (3/8)\, Y(n-2) = -x(n) + 2x(n-1)$.

Turn over

13. (a) Determine whether the following signals are energy or power and calculate their energy or power :

(i) $x(n) = (0.5)^n u(n)$

(ii) $x(t) = \cos^2(\omega t)$.

Or

(b) Explain Convolution integral and derive its equation.

14. (a) Determine the fourier transform for double exponential pulse whose function is given by $x(t) = e^{-2(t)}$ also draw its amplitude and Power spectra.

Or

(b) Obtain the inverse Laplace transform of the function :

$$X(s) = \frac{1}{s^3 + 3s + 2}; \text{ROC} - 2 < \text{Re}\{s\} < -1.$$

15. (a) Determine the Z Transform of $x(n) = a^n \cos(\omega n) u(n)$.

Or

(b) Find the inverse Z transform of the function $X(z) = \frac{1}{(1 - 1.5 z^{-1} + 0.5 z^{-2})}$ ROC $|z| > 1$.

(4 × 10 = 40 marks)