D 90180 (Pages : 2) Name.....

Reg. No.....

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

CS/PTCS 09 503—SIGNAL PROCESSING

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. Define unit impulse function.
2. Check whether the discrete time signal, Sin3n is periodic or not ?
3. List out of the Dirichlet's conditions of Fourier series.
4. State Parseval's relation for discrete time aperiodic signals.
5. What is the Z-transform of the sequence $x(n) = a^n u(n)$?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Find whether the signal $x(t) = 2\cos(10t + 1) - \sin(4t - 1)$ is periodic or not ?
7. Determine the Laplace transform of the signal,

$x(t) = \sin \pi t$; $0 < t < 1$

$= 0$ otherwise

8. Determine the Nyquist sampling rate and Nyquist sampling interval of the signal

$x(t) = \sin c^2(200\ \pi t)$

9. Write the properties of ROC of Laplace transform.
10. Find the Z-transform of $nU(n)$.
11. Define LTI system. List out the properties of LTI system and explain.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*

12. How are the signals classified ? Explain in detail.

Or

Turn over

13. Determine whether the following system is linear, time invariant, stable and invertible.

    (i) $y(n) = x^2(n)$.

    (ii) $y(n) = x(-n)$.

14. Find the Fourier transform of rectangular pulse. Sketch the signal and its Fourier transform.

Or

15. Find the Laplace transform of the signal $x(t) = e^{-at} u(t) + e^{-bt} u(-t)$.

16. State and prove sampling theorem for low-pass band limited signal and explain the process of reconstruction of the signal from its samples.

Or

17. What is aliasing ? Explain with an example.

18. Derive the necessary and sufficient condition for BIBO stability of an LSI system.

Or

19. Explain initial value and final value theorem in detail.

(4 × 10 = 40 marks)