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Reg. No. : ....

Name : ....

Third Semester B.Tech. Degree Examination, November 2014
(2013 Scheme)
13.302 : SIGNALS AND SYSTEMS (AT)

Time : 3 Hours Max. Marks : 100

PART – A

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

1. Define a stable system. Give an example.
2. Determine whether the given signal $x(t) = \text{Sin}\left(\frac{2\pi}{3}t\right)$ is periodic or not. If the signal is periodic, find the fundamental period.
3. Give Gibbs phenomena for Fourier series convergence.
4. Define Energy Spectral Density.
5. Give the condition for distortionless transmission of a signal.
6. State low pass sampling theorem.
7. If x (t) is band limited to W Hz, that modulates a high frequency carrier signal $c(t) = \cos(2\pi f_c t)$, with $f_c > W$, and generates the modulated signal, $s(t) = x(t)\cos(2\pi f_c t)$, find the Hilbert transform of s (t).
8. What is a reconstruction filter ?
9. Find the Z transform of $x(n) = e^{j\omega n} . u(n)$, and then get ROC.
10. Give any two properties of DTFS signal. **(10×2=20 Marks)**

P.T.O.

PART – B

Answer **any one** question from **each** Module. **Each full** question carries **20** marks.

Module – I

11. a) Determine whether the following signals are energy signals, power signals or neither.

   i) $A.Cos(\omega_0 t + \theta)$ ii) e^{-at} ; $t \geq 0$

   iii) $A.e^{j2\pi ft}$ iv) $2.e^{j3n}$ **8**

   b) Convolve the following two signals x (t) and h (t), then sketch all signals.

   $x(t) = 1 \quad 0 < t < T$ & $h(t) = t \quad 0 < t < 2T$

   $\quad\quad\; 0 \quad$ otherwise $0 \quad$ otherwise **12**

12. a) Sketch the signal given below

   i) $x(t) = u(t) - u(t-T) - u(t-2T) + u(t-3T)$

   ii) $x(t) = t.u(t) - (t-T)\,u(t-T)$ **8**

   b) The impulse response of system is $h(t) = 4(t) \quad 0 \leq t \leq T$

   $\quad\quad 0 \quad$ otherwise

   The input signal $x(t) = e^{-at}u(t)$. Find the output of the system y (t) for,

   i) $t < 0$,

   ii) $0 < t < T$,

   iii) $T > T$. **12**

Module – II

13. a) Prove the Parseval's theorem for CTFS. 6

b) Find the Inverse Laplace transform of $X(s) = \frac{s+8}{s^2+6s+13}$ 6

c) Find the Fourier Transform of,

i) $x(t) = t^2 u(t) u(1-t)$ and

ii) $x(t) = t \exp(-\alpha t) u(t), \alpha > 0$ 8

14. a) Give the properties of Fourier transform and explain briefly. 12

b) Find the Laplace transform of the given signal and give the ROC for each case.

i) $x(t) = u(t) + e^{-3t} u(t)$ and

ii) $x(t) = e^{-4t} u(t) - e^{-4(t-1)} u(t-1)$ 8

Module – III

15. a) What is flat top sampling ? Discuss with the help of necessary equations. 10

b) Explain the properties of continues time Hilbert transform. 10

16. a) State and prove band pass sampling theorem. 8

b) Find the Hilbert transform of the following functions.

i) $x(t) = \cos(2\pi ft) + \sin(2\pi ft)$ ii) $x(t) = e^{-j2\pi ft}$

iii) $x(t) = \delta(t)$ iv) $x(t) = \frac{1}{\pi t}$ 8

c) What is Aliasing ? Explain. 4

Module – IV

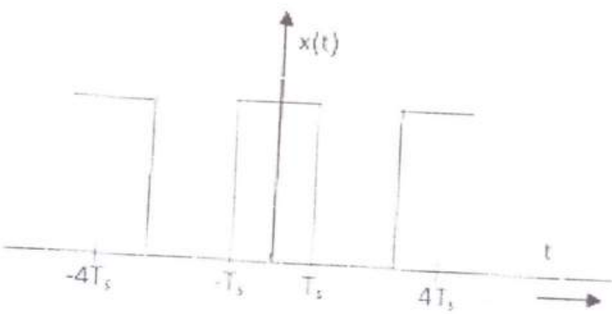
17. a) Find the DTFT of a signal x (n) given by

$$x(n) = 1 \quad 0 \le n \le N-1$$

$$0 \text{ elsewhere.}$$

Plot the magnitude and phase characteristics for $N = 5$. 10

b) Determine the Fourier Series of the square wave as shown in figure and sketch. 10



18 a) Briefly discuss the properties of Z transform. 12

b) Find out the Z-transform of the signal x (n).

$$x(n) = \left(\frac{1}{5}\right)^n .u(n) + \left(\frac{1}{8}\right)^n .u(n)$$ 8