

Code: EM3T2, EC3T3

II B.Tech - I Semester – Regular Examinations - January 2014**SIGNALS & SYSTEMS**
(Common for ECM, ECE)

Duration: 3 hours

Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1 a) A signal is defined as

$$\begin{aligned} f(t) &= t-2; -2 \leq t \leq 0 \\ &= 2-t; 0 \leq t \leq 2 \\ &= 0; \text{ otherwise} \end{aligned}$$

Check whether it is energy (or) power signal. Also find the energy and power of the signal. 7 M

b) Find the even and odd components of the signal

$$x(t) = \sin 2t + \cos 2t \quad 7 M$$

2 a) Find the convolution of the following signals using graphical method

$$x(t) = e^{-3t} u(t), h(t) = u(t+3) \quad 7 M$$

b) Obtain the convolution between the following sequences

$$x(n) = u(n), h(n) = 2^n u(n) \quad 7 M$$

3 a) Derive the condition for approximating a function by a set of mutually orthogonal functions. 7 M

- b) Explain the conditions for orthogonality of functions. Also show that sinusoidal functions are orthogonal. 7 M
- 4 a) Find the exponential Fourier series coefficients of the signal
- $$x(t) = 2 + \cos\left(\frac{2\pi t}{3}\right) + \sin\left(\frac{5\pi t}{3}\right) \quad 7 \text{ M}$$
- b) Find the Fourier series for the periodic signal $x(t) = t^2; 0 \leq t \leq 1$, so that it repeats every 1sec. 7 M
- 5 a) Find the Fourier transform of the signal
- $$x(t) = e^{-at^2} \quad 7 \text{ M}$$
- b) State and prove Parseval's theorem in Fourier transforms. 7 M
- 6 a) Find the response of a discrete time LTI system with impulse response $h(n) = \left(\frac{1}{3}\right)^n u(n)$ for the input $x(n) = 2^n u(n)$. 7 M
- b) State and prove convolution property in DTFT. 7 M
- 7 a) State and explain sampling theorem for continuous time signals. 7 M

b) Determine the Nyquist rate and Nyquist interval for the signal.

$$x(t) = \frac{1}{\pi t} \sin(500 \pi t) \quad 7 \text{ M}$$

8 a) Find the transfer function and impulse response of a discrete time LTI system described by the difference equation

$$y(n) = \frac{1}{2} y(n-1) + x(n) + \frac{1}{3} x(n-1) \quad 7 \text{ M}$$

b) Find the inverse Z- transform of

$$X(z) = \frac{z^3}{(z+1)(z-1)^2} \quad 7 \text{ M}$$