

Code: EM3T2, EC3T3

II B.Tech - I Semester – Regular Examinations – December 2014

SIGNALS & SYSTEMS
(Common for ECM, ECE)

Duration: 3 hours

Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

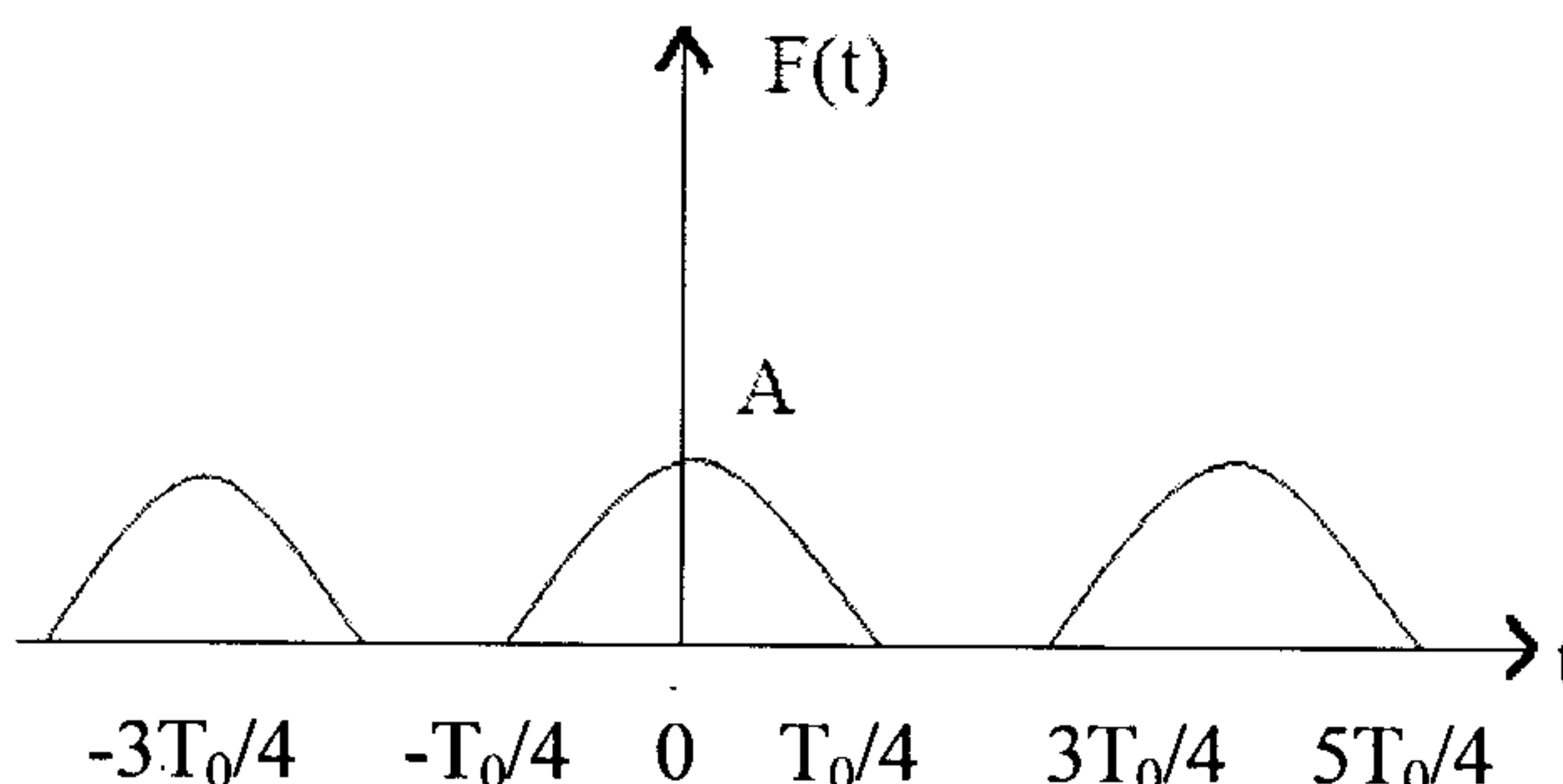
- 1 Determine whether the following systems are static or Dynamic, Linear or Nonlinear, Shift variant or Invariant, Causal or Non-causal, Stable or unstable. 14 M
 - (i) $y(t) = x(t+10) + x^2(t)$
 - (ii) $dy(t)/dt + 10 y(t) = x(t)$.

- 2 A system is described by the differential equation.
 $d^2y(t)/dt^2 + 3dy(t)/dt + 2y(t) = dx(t)/dt$ if $y(0) = 2$; $dy(0)/dt = 1$
and $x(t) = e^{-t} u(t)$. Determine the response of the system to a unit step input applied at $t=0$. 14 M

- 3 a) Define a complete set and hence show that the error can be minimized when the function $f(t)$ is approximated using n set of orthogonal functions. 7 M

b) Derive the necessary expression to represent the function $f(t)$ using Trigonometric Fourier series. 7 M

- 4 a) Determine the complex Fourier series representation of the signal show in the figure below. 7 M



- b) Explain about the properties of continuous time Fourier series. 7 M
- 5 a) The input and output of a causal LTI system are related by the differential equation. 7 M
- $$d^2y(t)/dt^2 + 6dy(t)/dt + 8y(t) = 2x(t)$$
- i) Find the impulse response of the system.
- ii) What is the response of this system if $x(t) = t e^{-2t} u(t)$.
- b) Bring the equivalence between Laplace transform and Fourier transform. 7 M
- 6 a) State and prove the circular time shifting and circular frequency shifting properties of discrete Fourier transform. 7 M
- b) Find the discrete Fourier Transform of the following. 7 M
- (i) $x(n) = a^n, 0 < n < N-1$;
- (ii) $x(n) = \delta(n-n_0)$ where $0 < n_0 < N$;

7 State and prove the sampling theorem. Also explain how reconstruction of original signal is done from sampled signal.

14 M

8 a) Find the inverse z-transform of $x(z) = (1+3z^{-1}) / (1+3z^{-1} + 2z^{-2})$ using residue method.

7 M

b) Give the relationship between z-transform and Fourier transform.

7 M