Printed Pages: 6 | 950/933/931 | NEE-303/EEE-301/EE-302

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID :121303/121321/121312   Roll No. ☐☐☐☐☐☐☐☐☐☐

B.Tech.

(SEM. III) THEORY EXAMINATION, 2015-16

BASIC SYSTEM ANALYSIS (NEE-303/EEE-301)

BASIC OF SIGNALS & SYSTEMS (EE-302)

[Time:3 hours]   **Section-A**   [Total Marks:100]

1. Attempts **all** parts. All parts carry equal marks. Write answer of each part in short.   (2x10=20)

   (a) Define unit step and unit ramp signals with proper sketch.

   (b) Check the periodicity of the signal $x(t)=e^{j10t}$

   (c) Write Dirichlet conditions for the existence of Fourier series.

   (d) Find the Fourier transform of $(t-t_0)$.

   (e) What is time invariant and time varying system.?

   (f) State initial value theorem of z-transforms.

   (g) Find Z-transform of unit step and impulse functions

   (h) Derive Laplace transform of $\sinh \omega t$.

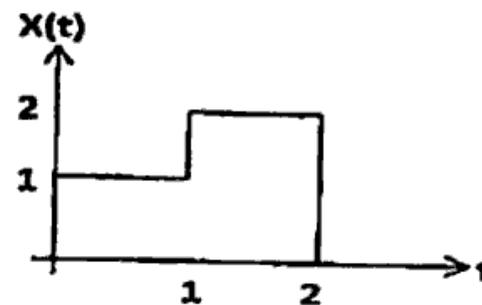(i) Express the given signal in terms of step signals.

Fig.1

(j) List the advantages of state space representation of linear systems.

Section-B

Attempts **any five** question from this sections.   (10x5=50)

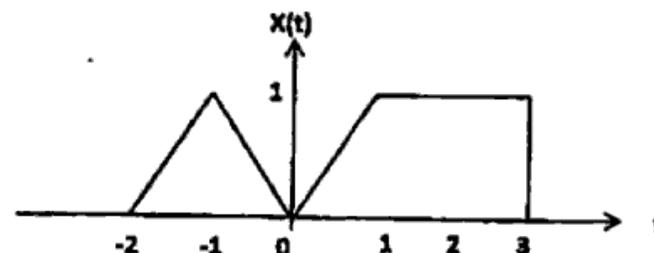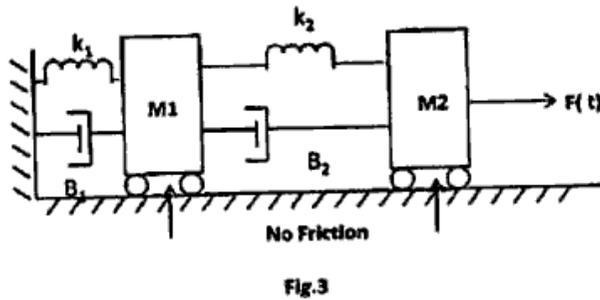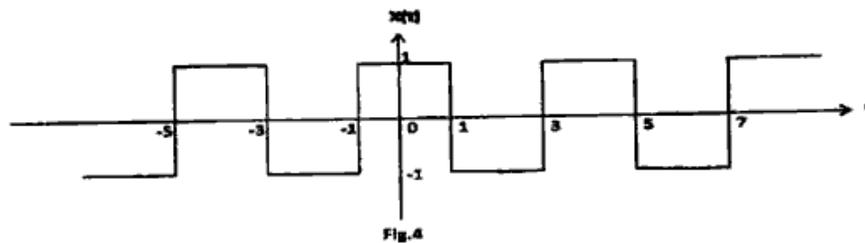2. (a) Find the even and odd components of the signal shown in figure.

Fig.2

(b) Draw the force-Current analogy of the mechanical given in figure.

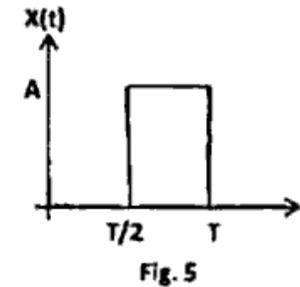Fig.3

3. Explain the trigonometric and exponential forms of Fourier series representation of periodic signals. Find the trigonometric Fourier series for the periodic signal shown in figure.

Fig.4

4. (a) State and prove duality property of Fourier transform.

(b) Find the Fourier transform of rectangular function shown in fig.

Fig. 5

5. State and prove initial and final value theorem of laplace transform.

6. Discuss the important properties and application of Laplace transform. Using Laplace transform solve the following differential equation-

$$2\ddot{x}(t) + 7\dot{x}(t) + 6x(t) = 0; \quad x(0) = 0, \quad \dot{x}(0) = 1$$

7. Find the Z-transform of following functions:

   (i) $x[n] = a^n u[n]$

   (ii) $x[n] = -b^n u[-n-1]$

8. (a) Prove the convolution theorem of Z-transform.

   (b) Find the Z-transform of $\cos w_0 n u[n]$.

9. (a) What do you mean by controllability and observability in state variable analysis of system.

(b) Obtain the state transition matrix of a system given by.

$$A=\begin{bmatrix} -1/2 & -5/2 \\ 1/2 & -7/2 \end{bmatrix}$$

Section-C

Attempts **any two** questions from these sections.$(15\times2=30)$

10. (a) What is a LTI system? Check the linearity of the system $y(t)\dfrac{dy(t)}{dt}+y(t)=5x(t)$.

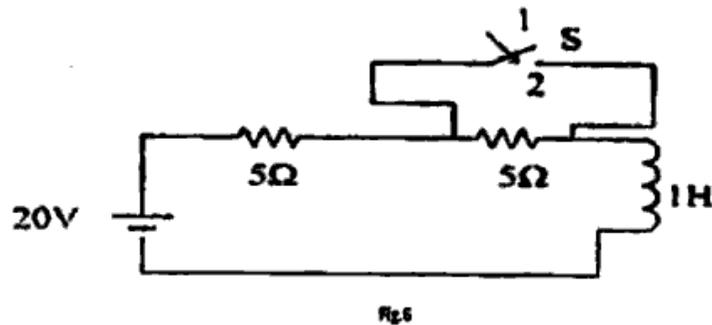**moved** to position 2. Find the current $i(t)$ in the circuit.

Fig.6

11. Find the inverse Z-transform of following:

(i) $X(z)=\dfrac{1-\dfrac{1}{3}z^{-1}}{\left(1-z^{-1}\right)\left(1+2z^{-1}\right)}$ ROC:$|z|>2$

(ii) $X(z)=\log\left(1+az^{-1}\right)$ ROC:$|z|>|a|$

12. (a) What is state transition matrix? List the important properties of state transition matrix.

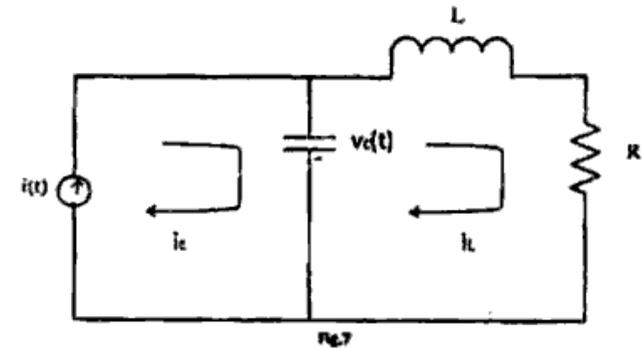(b) Obtain the state model of the electrical circuit show in Fig.7

Fig.7

—X—