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**B.TECH**  
**(SEM V) THEORY EXAMINATION 2017-18**  
**BASIC SYSTEM ANALYSIS**

*Time: 3 Hours*

*Total Marks: 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

**SECTION-A**

Attempt *all* questions in brief.

**2 x 10 = 20**

- a) Write the condition for existence of laplace transform.
- b) Write any two properties of laplace transform.
- c) What is the fourier transform of impulse signal.
- d) What is the difference equation.
- e) What is the region of convergence.
- f) What are the properties of state transition matrix
- g) Define state, state variable and state vector.
- h) Find the eigen value of  $\begin{bmatrix} -2 & 1 \\ 0 & -1 \end{bmatrix}$
- i) Check for the periodicity of  $je^{j10t}$
- j) Check the system is causal or not;  
 $y(t)=x(t)+x(t-1)$

**SECTION - B**

2. Attempt any *three* of the following:

**10 x 3 = 30**

a) Sketch the waveforms of the following:

- i.  $x(t) = u(t) - 2u(t-1) + u(t-1)$
- ii.  $y(t) = r(t+1) - r(t) + r(t-2)$

b) Distinguish the following system:

- i. Linear and non linear systems
- ii. Time invariant ant time varying systems

c) Determine the inverse Laplace of the following:

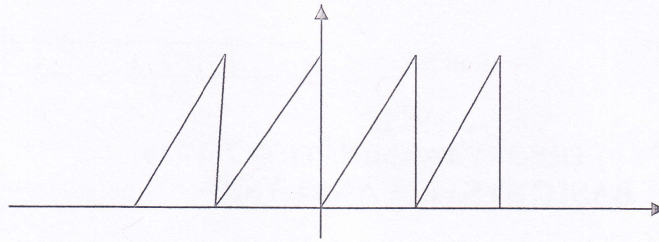
- i.  $\frac{s-1}{s(s+1)}$
- ii.  $\frac{s^3+1}{s(s+1)(s+2)}$

d) Find the state transition matrix for

$$A = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix}$$

Also write the properties of STM.

e) Find the trigonometric Fourier series for continuous time sawtooth wave shown

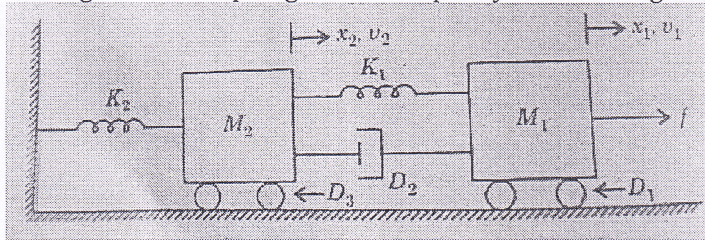


### SECTION - C

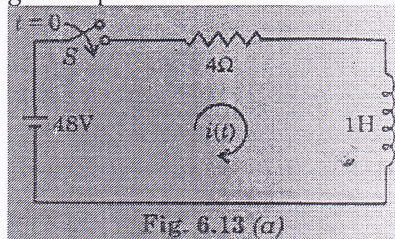
3. Attempt any one part of the following:

10 x 1 = 10

- a) Write the force-voltage analogy. Also draw the force voltage analogous of the spring mass-damper system of the given fig.



- b) Consider the R-L circuit with  $R=4\Omega$  and  $L=1H$  excited by a 48V d.c. source as shown. Assume the initial current through inductor is 3A. Using the laplace transform determine the current  $i(t)$ .



4. Attempt any one part of the following:

10 x 1 = 10

- a). Write five properties of Fourier transform. Also find the fourier transform of the following:

- i.  $\frac{2}{1+t^2}$
- ii.  $\cos(2\pi t + \frac{\pi}{4})$

- b) Find the laplace transform of output waveform of half wave rectifier .

5. Attempt any one part of the following:

10 x 1 = 10

(a) Define unit step, unit impulse, and unit ramp signals. Give their mathematical representation and characteristics.

(b) A Continuous time signal  $x(t)$  is shown below, Fig(2). Sketch and label each of the following signals:  $x(t-2)$ ;  $x(2t)$ ;  $x(t/2)$  and  $x(-t)$ .

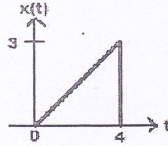
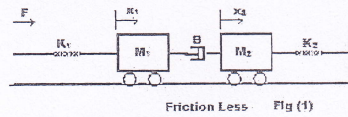


Fig (2)

6. Attempt any one part of the following:

10 x 1 = 10

(a) List the corresponding electrical and mechanical quantities for (i) force-voltage analogy, (ii) force-current analogy.



(b) For the given Laplace transform  $Y(s) = (17s^3 + 7s^2 + s + 6) / (s^5 + 3s^4 + 5s^3 + 4s^2 + 2s)$

Find the initial and final values of the corresponding time function  $y(s)$ .

7. Attempt any one part of the following:

10 x 1 = 10

(a) State and prove convolution theorem.

(b) Draw the wave form of given function

- (i)  $\cos\omega t u(t-t_0)$     (ii)  $\cos\omega(t-t_0) u(t)$     (iii)  $\cos\omega(t-t_0)$     (iv)  $\cos\omega(t-t_0) u(t-t_0)$   
 (v)  $\cos\omega(t)u(t)$