

(c) obtain the state variable representation of the systems described by the following differential equations

(i)  $\ddot{y} + 4\dot{y} + 5y + 2y = u$

(ii)  $\frac{d^3x}{dt^3} + 3\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + 4x = u_1(t) + 3u_2(t) + 4u_3(t)$

and the outputs,

$$y_1 = 4\frac{dx}{dt} + 3u_1$$

$$y_2 = \frac{d^2x}{dt^2} + 4u_2 + u_3$$

5. Answer any TWO parts: 10x2=20

(a) Solve the following difference equation by means of the z-transform:  $f(k+2) - f(k) = 0$ ;  $f(0) = 1$ ,  $f(1) = 1$

(b) Determine the discrete time signal for which the z-transform of a function  $f(t)$  is given by:

$$f(z) = \log(1 + az^{-1}); |z| > |a|$$

(c) find the inverse z-transform of

$$f(z) = \frac{36z^2 - 10z}{12z^2 - 7z + 1}; \text{ROC: } \frac{1}{4} < |z| < \frac{1}{3}$$

Printed Pages : 4



EEE-301

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

**PAPER ID : 121306**

Roll No. 

--	--	--	--	--	--	--	--	--	--

**B. Tech.**

(SEM. III) (ODD SEM.) THEORY  
EXAMINATION, 2014-15  
**BASIC SYSTEM ANALYSIS**

Time : 3 Hours]

[Total Marks : 100

**Note :** Attempt all questions.

1. Answer any TWO parts: 10x2=20

(a) Determine whether the system  $y(t) = 10x(t) + 5$  is

- (i) Static or dynamic
- (ii) Linear or non linear
- (iii) Causal or noncausal
- (iv) stable or unsatable.

(b) Synthesize the waveform as shown in Fig.1 in term of basic signals.

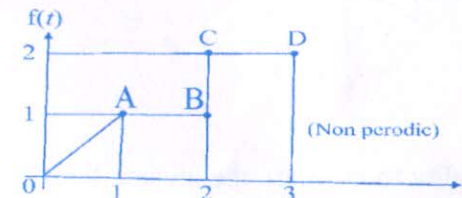


Fig. 1  
1

- (c) Draw the equivalent mechanical system of the given system. Hence write the set of equilibrium for it and obtain electrical analogous circuits using,  
 (i) F-V Analogy and (ii) F-I Analogy

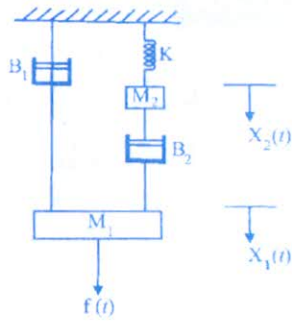


Fig. 2

2. Answer any TWO parts: 10x2=20

- (a) List the properties to be satisfied by a periodic function for which Fourier series exists. Discuss the procedure for evaluating coefficient of a trigonometric Fourier series.  
 (b) Using waveform symmetries obtain trigonometric Fourier series for the following sawtooth waveform.

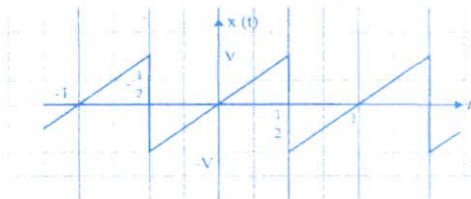


Fig. 3

- (c) Use duality to evaluate the inverse Fourier transform of the step function in frequency,  $F'(j\omega) = u(\omega)$

3. Answer any TWO parts: 10x2=20

- (a) Find the Laplace transformation of voltage waveform Shown in fig. 4

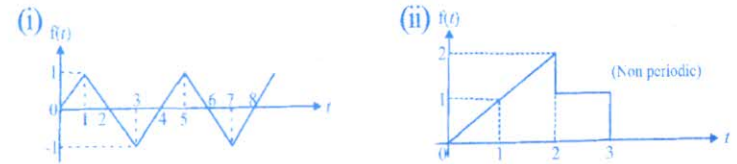


Fig. 4

- (b) Find the inverse Laplace Transformation of following

(i)  $\frac{3s}{(s^2+1)(s^2+4)}$       (ii)  $\frac{s^2}{(s^2+1)^2}$

- (c) Consider the circuit shown in figure 3, where the switch S is switched on at  $t=0$ . Obtain the expression for the current. Also find the current through the capacitor at  $t=0^+$ . Assume the capacitor to be discharged initially.

4. Answer any TWO parts: 10x2=20

- (a) Define and explain the following terms,  
 (i) State variables    (ii) State vector  
 (iii) State trajectory    (iv) State  
 (v) State Space.  
 (b) System matrix of a system is given by

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

Find the state transition matrix  $\Phi(t)$  of the system,