Printed Pages : 4

NEE-303

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

PAPER ID : 121314

Roll No.

B. Tech.

(SEM. III) (ODD SEM.) THEORY EXAMINATION, 2014-15

BASIC SYSTEM ANALYSIS

Time : 2 Hours] [Total Marks : 50

1 Attempt any **four** parts of the following : **3.5×4=14**

a) Sketch the signals

$$y(t)=r(t+2)-r(t)+r(t-2)$$

$$y(t)=u(t)+5u(t-1)-2u(t-2)$$

b) Define various elementary continuous time signals. Indicate them graphically.

c) Find the Fourier transform of $e^{2t}u(-t)$ along with amplitude.

d) Define Laplace transform and write its properties.

e) What do you mean by STM ? Also mention its properties.

f) What do you understand by analogous systems ? Also mention the f-v and f-i analogy in analogous systems.

2 Attempt any **two** parts of the following : **6×2=12**

a) Obtain the trigonometric Fourier series for the waveform shown in figure 1.

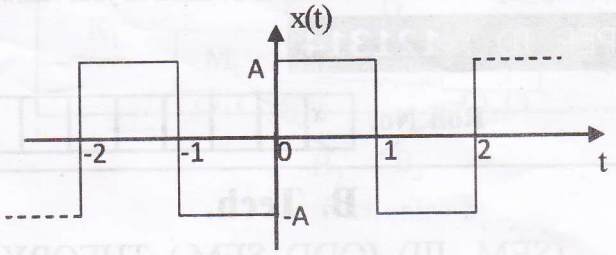

Figure 1

b) Determine the inverse Z-transform of $X(z) = \frac{z}{(3z^2-4z+1)}$ if region of convergence are

(i) $|z|>1$ (ii) $|z|<\frac{1}{3}$ (iii) $\frac{1}{3}<|z|< 1$

c) A system is described by the differential equation

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = x(t)$$

For the initial conditions, $\frac{dy(0)}{dt} = 2$ and $y(0) = 1$and input $x(t) = u(t)$, find the free and forced response of the system.

3 Attempt any **two** parts of the following : **6×2=12**

a) Define ROC of Z-transform. Determine Z-transform of $x_1(t) = a^n u(n)$ and $x_2(n) = -a^n u(-n-1)$ and also indicate their region of convergence.

b) State convolution property of LT. Also find the inverse Laplace transform of the function using it.

$$X(s) = \frac{1}{s^2(s+1)}$$

c) Find the response of the system

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} x + \begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix} u(t), \quad x(0) = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \quad and \quad y(t) = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} x$$

$$where\ u(t) = \begin{bmatrix} u(t) \\ e^{-3t}u(t) \end{bmatrix}$$

4 Attempt any **two** parts of the following : **6×2=12**

a) In the circuit shown in figure 2 , determine the current i(t) when the switch is at position 2. The switch *S* is moved from position 1 to position 2 at t = 0. Initially the switch has been at position 1 for a long time.

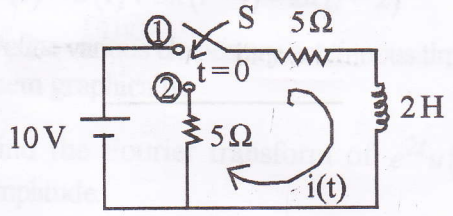

Figure 2

b) Obtain the f-v and f-i analogous system of the mechanical system shown in figure 3

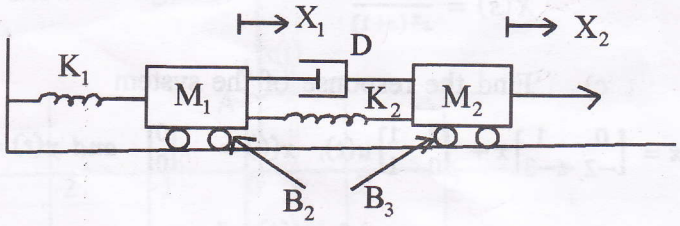

Figure 3

c) Check whether the following properties hold good for the system $y(t) = atx(t) + bt^2x(t-2)$

(i) Static or dynamic
(ii) Linear or non linear
(iii) Causal or non causal
(iv) Time variant or invariant.