Printed Pages : 4 EEE301

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

PAPER ID : 0208 Roll No.

B.Tech

(SEM III) ODD SEMESTER THEORY EXAMINATION 2009-10

BASIC SYSTEM ANALYSIS

Time : 3 Hours] *[Total Marks : 100*

Note : *(i) Attempt all five questions. All questions carry equal marks.*

(ii) Assume missing data if any.

1 Answer any **four** parts of the following : 5×4=20

(a) Define unit step, unit impulse and unit ramp using mathematical expressions.

(b) The waveform is shown in **Fig. 1(b)**. Write an equation for this waveform $v(t)$ using step functions :

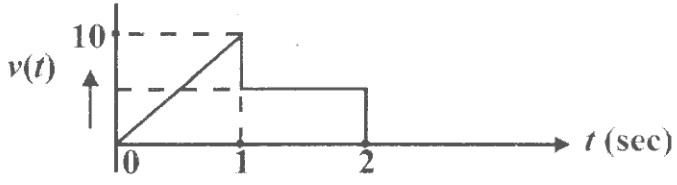

Fig. 1(b)

(c) Compare the mechanical system with electrical system using force-voltage analogy. Also write suitable expressions of it.

(d) Distinguish between time invariant and time varying system with suitable example.

(e) Consider a series R-L circuit shown in **Fig. 1(e).** The switch is used at time $t = 0$. Find current $i(t)$ using classical method.

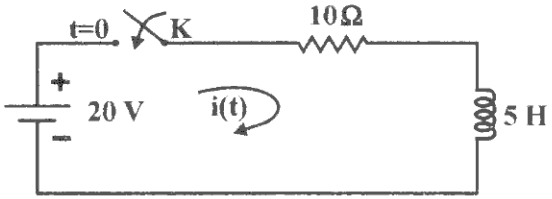

Fig. 1(e)

(f) What is sinusoidal function ? Explain, why alternating voltage (current) of sinusoidal form is used in system analysis.

2 Attempt any **two** parts of the following : **10×2=20**

(a) Find the trigonometric Fourier series for continuous time saw-tooth wave shown in **Fig. 2(a).**

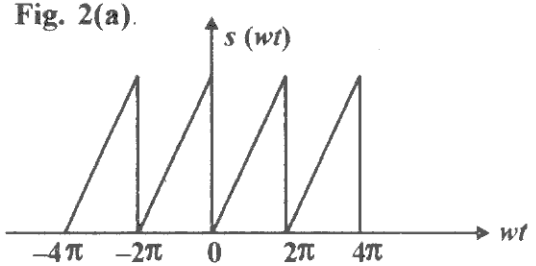

Fig. 2(a)

(b) Define odd and even function in Fourier analysis. Also find the Fourier coefficients of rectified sine wave form.

(c) Explain the Fourier symmetry. Write the Fourier transform of step, ramp and impulse signals for system analysis.

3 Attempt any **two** parts of the following : 10×2=20

(a) Find $L\left[t^2 \sin wt\right]$ using the relation

$$L[t\, f(t)] = -\frac{d}{ds} f(s).$$

(b) Using Laplace transform solve differential equation

$$2\frac{d^2x}{dt^2} + 7\frac{dx}{dt} + 6x = 0$$

with $x(0) = 0$, $\frac{dx}{dt} = 1$.

(c) Explain initial value and final value theorems in Laplace analysis. Also find the final value of $F(s) = \frac{2s}{(s+2)(s+5)}$.

4 Attempt any **two** parts of the following : 10×2=20

(a) In the network shown in **Fig. 4(a)**, formulate and find the solution for $i_1(t)$ and $i_2(t)$ using state equations.

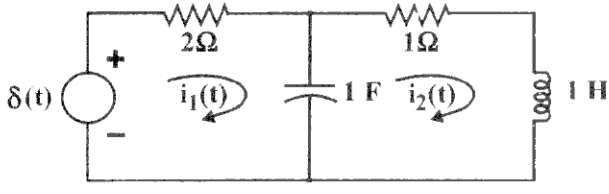

Fig. 4(a)

Assume zero initial conditions.

(b) Represent

$$\frac{d^3y}{dt^3}+3\frac{d^2y}{dt^2}+4\frac{dy}{dt}+y=\frac{d^3u}{dt^3}+3\frac{d^2u}{dt^2}+\frac{du}{dt}+2u(t)$$

in its standard state space form.

(c) State and explain controllability and observability in state-space analysis. Enlist the condition for controllability and observability of a system.

5 Attempt any **two** parts of the following : **10×2=20**

(a) Find z-transform of the following :

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

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

(b) Explain the public transfer function approach used in Z-transform analysis with the help of suitable example.

(c) Using Z-transform analysis, solve differential equation

$$\ddot{x}+4\dot{x}+8x=0$$

with $x(0)=3$ and $\dot{x}(0)=-4$.