



Printed Pages : 4

TEE-301

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

PAPER ID : 2047

Roll No.

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B. Tech.

(SEM. III) EXAMINATION, 2008-09
BASIC SYSTEM ANALYSIS

Time : 3 Hours]

[Total Marks : 100

- Note :*
- (i) Attempt all questions.*
 - (ii) All questions carry equal marks.*
 - (iii) In case of numerical problems assume data wherever not provided.*

- 1** Attempt any four parts of the following : **5×4=20**
- (a) Whether following continuous-time signal is periodic or not ?

$$S(t) = \begin{cases} \cos(t) & \text{if } t < 0 \\ \sin(t) & \text{if } t \geq 0 \end{cases}$$

- (b) Distinguish the following system :
 - (i) Linear and non-linear systems
 - (ii) Time-invariant and time-varying systems.
- (c) Input-output relationship for following continuous time systems is given as
 - (i) $y(t) = s(t - 2) + s(2 - t)$
 - (ii) $y(t) = \cos(3t) s(t)$whether the system is causal or not ?

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[Contd...

- (d) Discuss force-current analogy used for electrical analog of the mechanical systems. Also write rules for it.
- (e) Draw the force-voltage analogous of the spring mass-damper system given in Fig. 1(e).

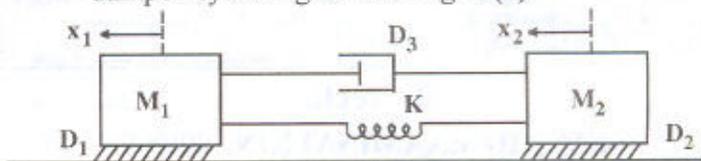


Fig. 1(e) Mechanical system

- (f) What do you mean by electro-mechanical systems. Discuss fundamental theory of electro-mechanical systems with suitable examples.

2 Attempt any two parts of the following : $10 \times 2 = 20$

- (a) Find the continuous time Fourier transform of the double gate function shown in Fig. 2(a) using time-shifting property.

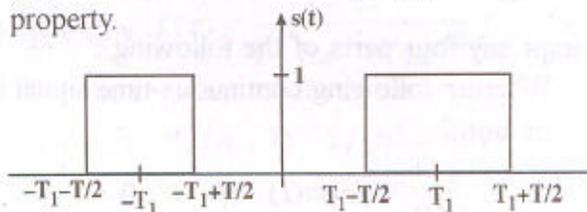


Fig. 2(a) Double gate function

- (b) Find the continuous time Fourier transform of the following functions :
 - (i) Impulse function
 - (ii) Sinusoidal function
 - (iii) Signum function
- (c) What are Desichlet conditions ? Also determine the complex exponential Fourier series for the continuous-time periodic signal $s(t) = A |\sin wt|$.



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

- (a) Define Laplace transform. Give the relationship between Laplace transform and continuous time Fourier transform. Find the initial and final value of the function

if its Laplace is given by $F(s) = \frac{(s-2)}{s(s+1)}$

- (b) Determine the inverse Laplace of the following :

(i) $\frac{s-1}{s(s+1)}$

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

- (c) Laplace transform of the network is given by

$$H(s) = \frac{3s}{(s+2)(s^2+s+2)}$$

- (i) Draw plot-zero plot
(ii) Find its impulse response $b(t)$.

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

- (a) Write various important properties of state-transition matrix, system matrix of a system is given by

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

Find the state transition matrix $\phi(t)$ of the system.

- (b) State space representation of a system is given by

$$\dot{X} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$



where $u(t) \leftrightarrow$ unit step function and all initial conditions are zero. Find the time response of the system.

- (c) What is diagonalisation matrix? Obtain the state-space representation of the network given in Fig. 4(c).

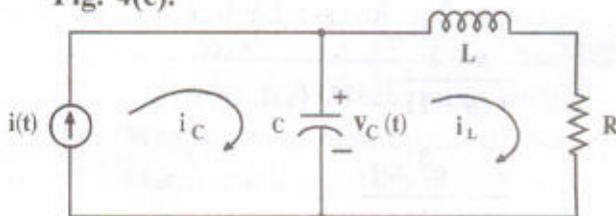


Fig. 4(c)

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

- (a) Determine the causal discrete-time signal $f(n)$ for

$$f(z) \text{ given by } f(z) = \frac{1 + 2z^{-1}}{1 - 2z^{-1} + 4z^{-2}}$$

- (b) (i) Find the response of the system

$$f(n + z) - 3f(n + 1) + 2f(n) = 8(n)$$

when all the initial conditions are zero.

- (ii) Find the initial and final values of the sequence $f(n)$. Given

$$F(z) = 2 + 3z^{-1} + 4z^{-2}$$

- (c) Define Z-transform. Give the relationship between Z-transform and discrete-time Fourier transform. Also determine the inverse z-transform for

$$F(z) = \frac{z-1}{1-3z^{-1}} \text{ with } ROC : |z| < 3.$$

