Printed Pages—5 **TEE301**

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

PAPER ID : 2047 Roll No. | | | | | | | | | | |

B.Tech.

(SEM. III) ODD SEMESTER THEORY EXAMINATION 2010-11

BASIC SYSTEM ANALYSIS

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt **all** the questions.

(2) Each question carries equal marks.

1. Attempt any **four** parts of the following : **(5×4=20)**

(a) What is a singal ? How signals are classified ? **5**

(b) Differentiate periodic and non-periodic signals with suitable examples. **5**

(c) Express the triangular waveform shown in Fig.1 using ramp functions. **5**

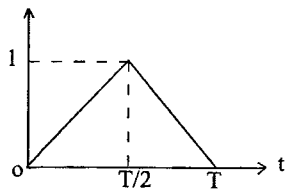

Fig.1.

(d) What is an analogous system ? Discuss. **5**

(e) What are the electrical elements analogous to the mechanical translational elements ? How they are analogous ? Explain. **5**

(f) Draw the analogous electrial circuit of the given mechanical system shown in Fig.2. Use f-v analogy. Write the system equations. **5**

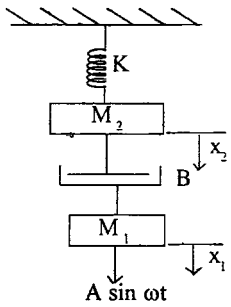

Fig.2

2. Attempt any **four** parts of the following : **(5×4=20)**

(a) Explain exponential form of Fourier series. **5**

(b) Discuss waveform symmetry with suitable examples. **5**

(c) Determine the trigonometric Fourier series of the waveform shown in Fig.3. **5**

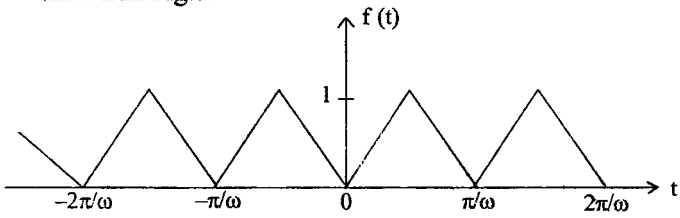

Fig. 3

(d) Determine the output voltage response across the capacitor to a current source excitation i(t)=e^{-t}u(t), as shown in Fig.4. **5**

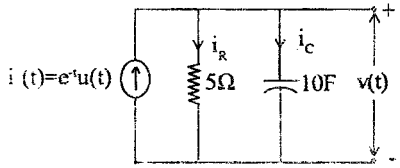

Fig. 4

(e) Find the Laplace transform of function : **5**

$f(t) = t$ for $0 < t < 1$

$= 0$ for $t > 1$

(f) What do you understand by the terms — state, state space, state variables and state vector ? **5**

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

(a) For the circuit shown in Fig.5 determine the current when the switch is moved from position 1 to position 2 at $t = 0$. The switch has been in position 1 for a long time to get steady state value. **10**

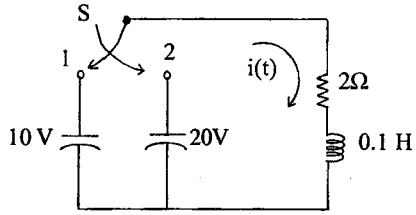

Fig. 5

(b) For the circuit shown in Fig.6, with $R = 1\Omega$, $C = 1F$, and $v_c(0) = 0V$. Determine output response v(t) when input i (t) is -

(i) impulse function

(ii) unit-step function. **10**

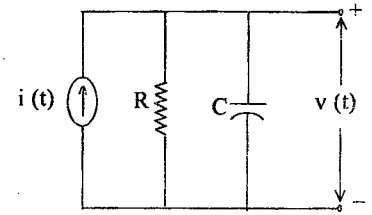

Fig. 6

(c) Synthesize and find the Laplace transform of the following waveforms : **10**

(i) Gate function of Fig.7(a)

(ii) Half cycle sine wave of Fig.7(b).

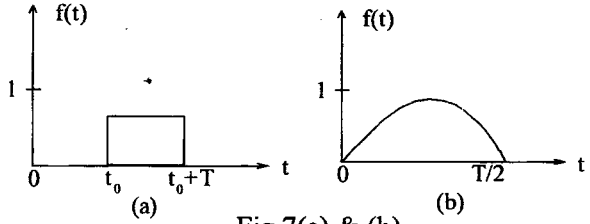

Fig.7(a) & (b)

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

(a) What is state transition matrix ? A system matrix is given by :

$$A = \begin{bmatrix} -½ & -5/2 \\ ½ & -7/5 \end{bmatrix}$$

Obtain the state transition matrix. **10**

(b) Obtain the state-space representation for the systems described by the following differential equations :

(i) $\dddot{y} + 7\ddot{y} + 14\dot{y} + 8y = 6u$

(ii) $\dddot{y} + 4\ddot{y} + 5\dot{y} + 2y = u$ **10**

(c) Obtain the state variable formulation of bridge network shown in Fig.8. **10**

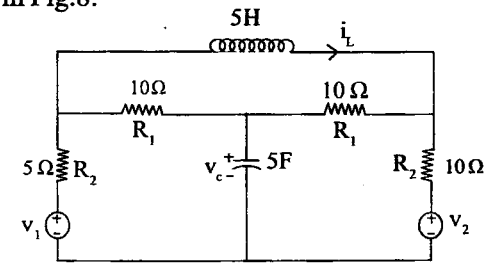

Fig. 8

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

(a) Find the inverse Z-transform of the following functions :

(i) $F(z) = \dfrac{2z+1}{(z-0.1)^2}$

(ii) $F(z) = \dfrac{2z}{z^2-1.2z+0.5}$. **10**

(b) Derive Z-transforms of exponential function, and sine and cosine functions. **10**

(c) Solve the following difference equation using the Z-transform method :

$x(k+2)+5x(k+1)+6x(k)=0$

$x(0)=0, \quad x(1)=1.$

Discuss the significance of the difference equation. **10**