

KATHMANDU UNIVERSITY
End Semester Examination [C]
June, 2018

JUN 11 2018

Level : B.E.

Course : EEG 213

Year : II

Semester : I

Exam Roll No. :

Time : 30 mins.

F. M. : 20

Registration No.:

Date :

SECTION "A"
[20 Q × 1 = 20 marks]

Choose the most appropriate answer for the following questions.

1) The switch in the circuit of Fig.1 is operated at $t=0$. What is the value of current at $t(0+)$?

a) 1.2 A

b) 0.2 A

c) 2.2 A

d) 0 A

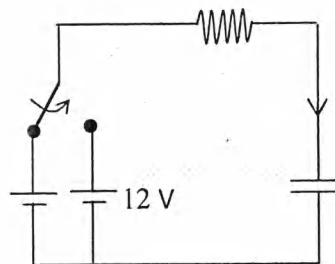


Fig.1

2) A series RL circuit has no source connected to it. The initial conditions of the components are not known. Which of the following best describes the network response?

a) The steady state current is zero at any condition.

b) The transient current is zero at any condition.

c) The steady state current is non zero at any condition.

d) The steady state current may be zero or nonzero.

3) For a RL circuit described by first order differential equation and driven initially by a DC voltage source of V volts, the time constant is T and the initial current is I_0 . The instantaneous current $i(T)$ is related to I_0 as:

a) $i(T) = 0.63I_0$

b) $i(T) = 0.37I_0$

c) $I_0 = 0.37i(T)$

d) $I_0 = i(T)$

4) The time constant of the RC circuit in Fig.2 is:

a) 2 ms

b) 4 ms

c) 8 ms

d) 2 s

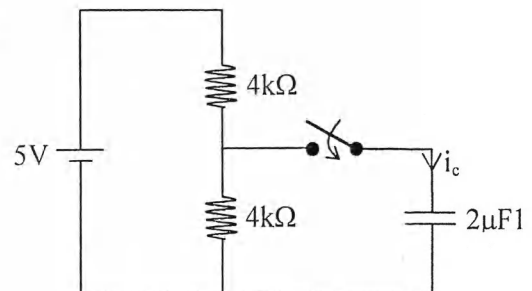


Fig.2

5) Which of the following component cannot store energy?

a) A resistor

b) An inductor

c) Both inductor and resistor

d) A capacitor

- 6) The reactance offered by a capacitor to ac of frequency 50 Hz is 10Ω . If the frequency is increased to double, reactance becomes ...
 a) 20Ω b) 10Ω c) 5Ω d) 2.5Ω
- 7) If Z and Y represent the impedance and admittance parameters of a two port network, which of the following is correct?
 a) $Z_{11} = \frac{Y_{11}}{\Delta Z}$ b) $Z_{11} = \frac{Y_{22}}{\Delta Z}$ c) $Z_{11} = \frac{Y_{11}}{\Delta Y}$ d) $Z_{11} = \frac{Y_{22}}{\Delta Y}$

- 8) A RC network is suddenly excited by a constant current source. The voltage drop across the network terminals where source is connected is shown in Fig.3. The network is:
 a) A series connection of R and C
 b) A parallel connection of R and C
 c) A parallel combination of a resistor with the series combination of resistor and capacitor
 d) A series combination of a resistor with the parallel combination of resistor and capacitor.

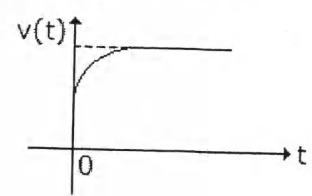


Fig.3

- 9) For the two port network shown in Fig.4, $Z_{11} = \dots\dots\dots$
 a) 8Ω b) 12Ω
 c) 13Ω d) none of above

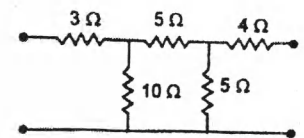


Fig.4

- 10) The transfer function of the circuit is $H(s) = \frac{1}{s+2}$. The impulse response $h(t)$ of the system is:
 a) $2e^{-2t}$ b) $0.5e^{2t}$ c) $0.5e^{-2t}$ d) $2e^{2t}$
- 11) The Laplace transform of unit step function is...
 a) $\frac{1}{s}$ b) $\frac{1}{s-1}$ c) $s-1$ d) $\frac{s}{s-1}$
- 12) For a series RLC network, excited by 100 V step input source, $H = 1H$ and $C = 4F$. The value of R for critical damping is.....
 a) 10Ω b) 5Ω c) 1Ω d) 2Ω
- 13) The series RLC network will be called under-damped if,
 a) $\xi = 0$ b) $0 < \xi < 1$ c) $\xi = 1$ d) $\xi > 1$
- 14) The transfer function of an electric network has simple pole at $s=-1$. In asymptotic magnitude bode plot, it represents a straight line.....
 a) a straight line with slope 20 dB per decade, passing through $\omega=1$
 b) a straight line with slope -20 dB per decade, passing through $\omega=1$
 c) a straight line with slope 20 dB per decade starting at $\omega=1$
 d) a straight line with slope -20 dB per decade starting at $\omega=1$
- 15) For a PRF, which is NOT TRUE?
 a) PRF must not have poles in negative half of s plane
 b) PRF may have poles on imaginary axis.
 c) Pole and zeros of a PRF must alternate
 d) Highest power of s in numerator may differ to that of denominator at most by unity

16) Which of the following network of Fig.5 will work as low pass filter?

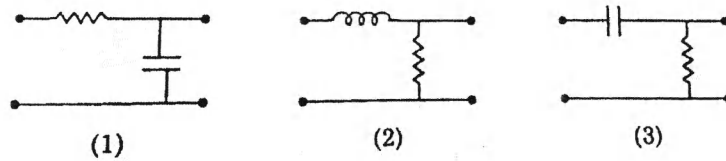
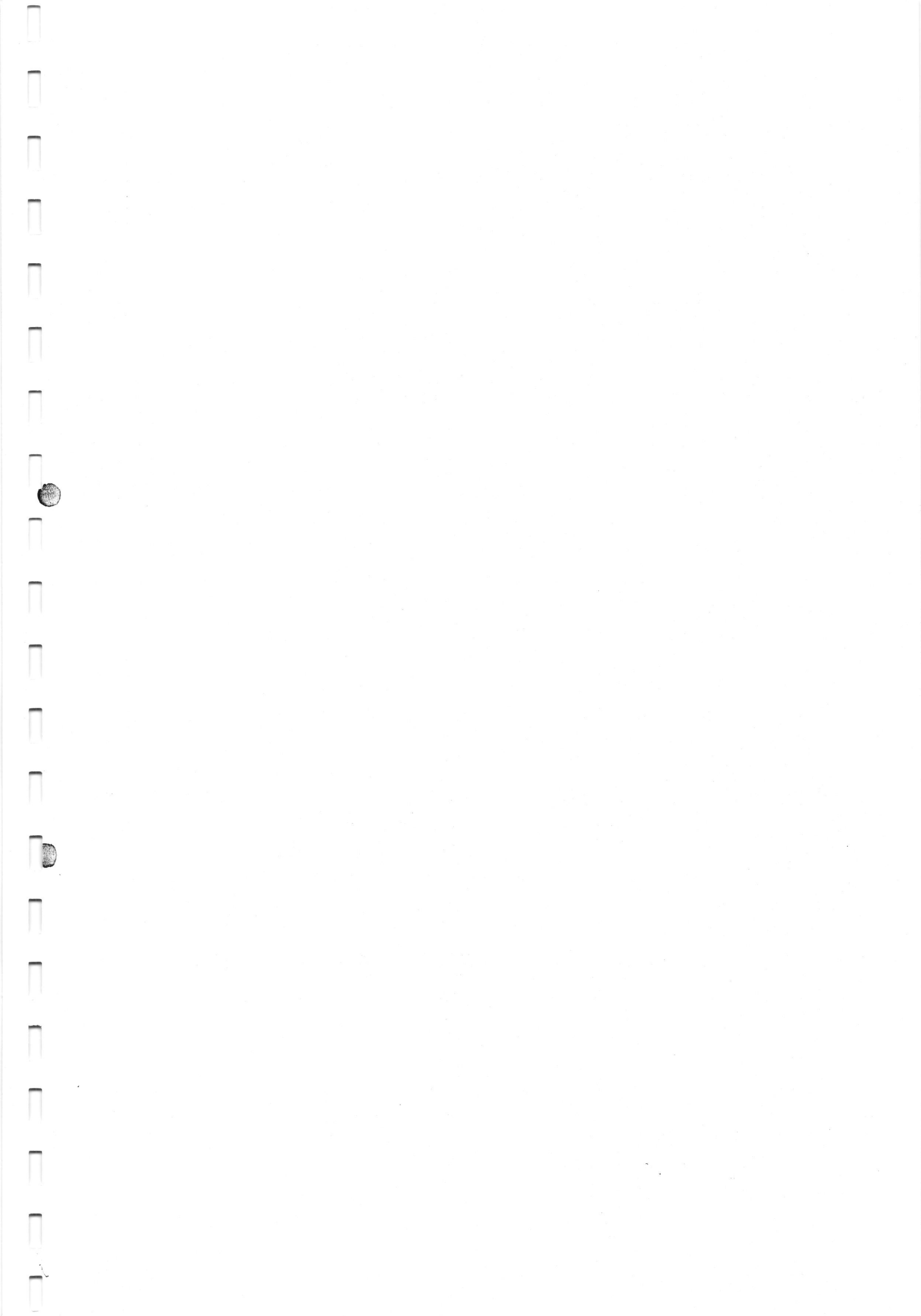


Fig.5

- a) 1 alone b) 1 and 3 c) 1 and 2 d) All 1, 2 and 3
- 17) The capacitor behaves as aat steady state for DC source.
 a) short circuit b) open circuit c) current source d) voltage source
- 18) While obtaining the transformed circuit using the Laplace transform, the inductor with value L is replaced by.....
 a) impedance Ls in series with a voltage source $Li(0-)$
 b) impedance $\frac{1}{Ls}$ in series with a voltage source $Li(0-)$
 c) impedance Ls in parallel with a current source $Li(0-)$
 d) impedance $\frac{1}{Ls}$ in parallel with a voltage source $Li(0-)$
- 19) A magnitude response of a Bode plot has a slope of 20 dB per decade. If the gain at $\omega = 10$ is 35, the gain vale at $\omega = 100$ is.....
 a) 35 b) 70 c) 55 d) 20
- 20) Which of the following is correct?
 a) $i_L(0-) = i_L(0+)$ and $i_C(0-) = i_C(0+)$
 b) $i_L(0-) = i_L(0+)$ and $v_C(0-) = v_C(0+)$
 c) $i_C(0-) = i_C(0+)$ and $v_L(0-) = v_L(0+)$
 d) $i_C(0-) = i_C(0+)$ and $v_C(0-) = v_C(0+)$



SECTION "B"

Attempt ANY FIVE questions. Assume necessary information if required.

1. a. Find the value of L for the circuits in Figure-1. The time response of current i of the circuit in Figure-1 is shown in Figure-2. [5]

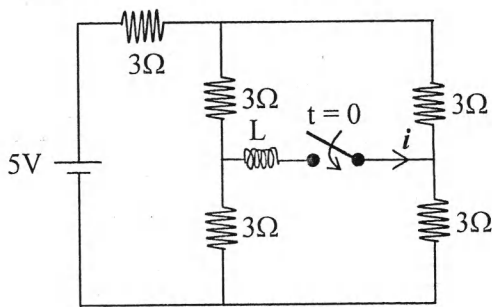


Figure-1

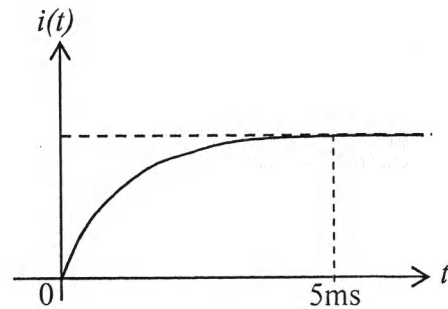


Figure-2

- b. Find the expression for $v_o(t)$ in Figure-3 for $t > 0$. [6]

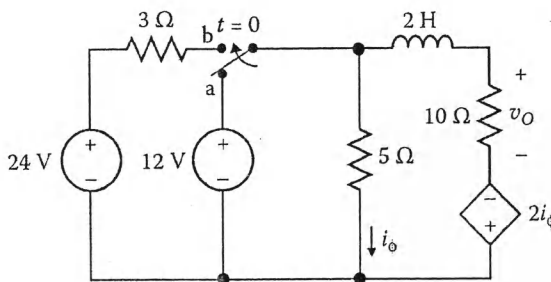


Figure-3

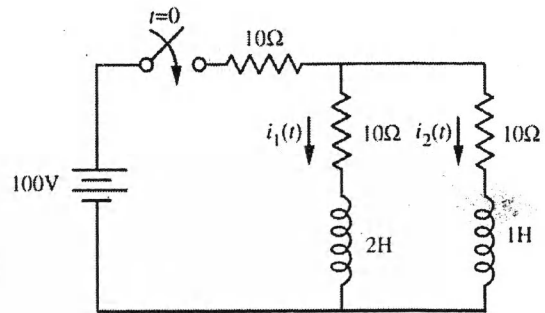


Figure-4

2. a. In the network of Figure-4, at $t = 0$, switch K is closed. Find the current through the $2H$ and $1H$ inductors for $t > 0$. [6]
- b. Find the z parameters for the network shown in Figure-5. [5]

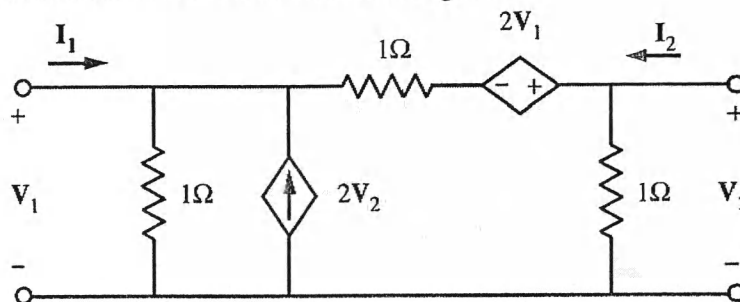


Figure-5

3. a. Plot the asymptotic magnitude response and phase response for the network function

$$G(s) = 180 \frac{s(1 + 0.01s)}{(1 + 0.05s)(1 + 0.001s)}$$

Use semi-log graph paper for the plots.

[8]

- b. Determine whether the following function is positive real function or not.

$$T(s) = \frac{s^3 + 5s^2 + 9s + 3}{s^3 + 4s^2 + 7s + 9}$$

[3]

4. a. For the network of Figure-6 determine the transfer function $V_o(s)/V_i(s)$.

[7]

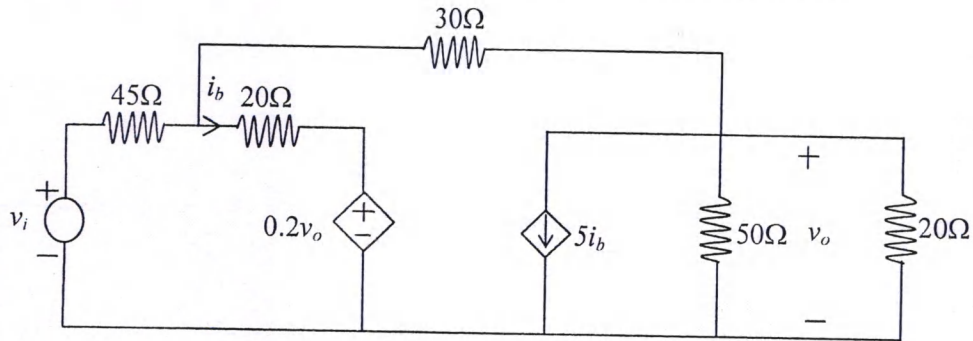


Figure-6

- b. Find the y parameters for the network of Figure-7.

[4]

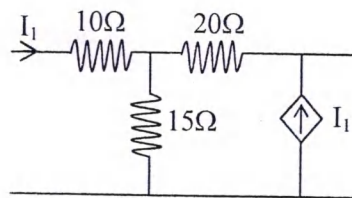


Figure-7

5. a. Find $v_a(0^-)$ and $v_a(0^+)$ for the circuit shown in Figure-8. Assume that the switch is closed at $t = 0$.

[5]

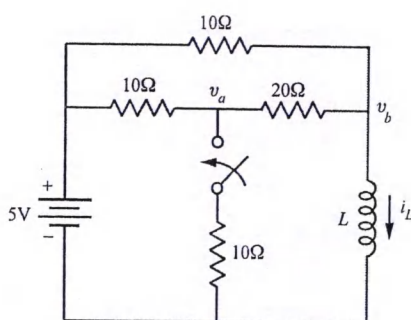


Figure-8

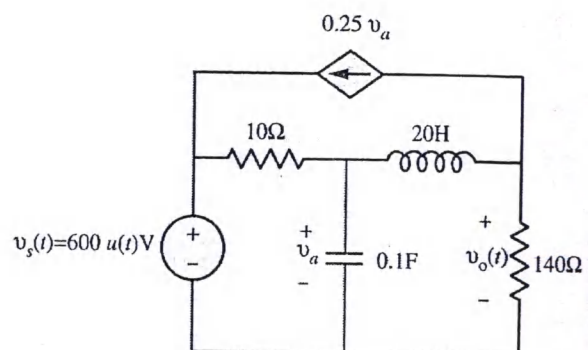


Figure-9

- b. Determine $v_o(t)$ for the network given in Figure-9 using Laplace transform method.

[6]

6. a. Find the Laplace transform of the periodic waveform shown in Figure-10. [4]

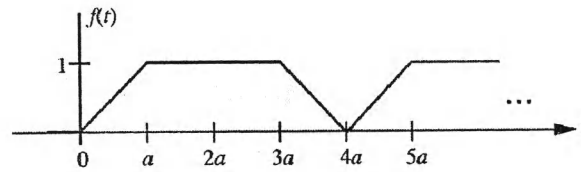


Figure-10

- b. A RLC series circuit is connected to a sinusoidal source $v = 2\sin 10t$, with a switch that operates at time $t = 0$. If $R = 8\Omega$, $L = 4\text{H}$ and $C = 1/4\text{F}$, find the voltage response $V_0(t)$ across the capacitor C. [4]
- c. Design an Op-amp based second order active low pass Butterworth filter at high cutoff frequency of 1 kHz. [3]

