Reg. No. | | | | | | | | | |

# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

*A Constituent Institution of Manipal University*

## III SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

## END SEMESTER EXAMINATIONS, NOVEMBER 2017

## SUBJECT: ELECTRICAL CIRCUIT ANALYSIS [ELE 2101]

REVISED CREDIT SYSTEM

**Time: 3 Hours** **Date: 16 November 2017** **Max. Marks: 50**

**Instructions to Candidates:**

- Answer **ALL** the questions.
- Missing data may be suitably assumed.

**1A.** For the circuit shown in Fig Q1A, use Superposition theorem to find the current through load resistance of 1 Ω. ***(03)***

**1B.** For the circuit shown in Fig Q1B, find the value of $R_L$ so that maximum power is transferred. Also, find the maximum power transferred. ***(03)***

**1C.** For the circuit shown in Fig Q1C, obtain the Thevenin`s equivalent circuit across the terminals AB. ***(04)***

**2A.** Find the Laplace transform of the periodic waveform v(t)(containing ramp and sinusoidal functions) shown in Fig Q2A. ***(02)***

**2B.** Find the initial and final values of the following function using Initial Value and Final Value Theorem, if applicable. If not applicable, mention the reason for the same.

$$i(t) = 5u(t) - 3e^{-2t} + e^{-t}(\sin t + \cos t)$$ ***(02)***

**2C.** Three impendances (8+j6) Ω, (2-j2) Ω and (R+j5) Ω are connected in parallel across a 100 V, 50 Hz single phase AC supply. Draw the current locus if the resistance 'R' varies from zero to infinity and hence determine (i) minimum current (ii) maximum current (iii) current at resonance and (iv) value of 'R' at resonance. ***(06)***

**3A.** The waveform for the first derivative of the function f(t) is shown in Fig Q3A.

(i) Obtain the equation for f(t) and sketch it.
(ii) Sketch the step response of f(t) obtained. ***(03)***

**3B.** In the circuit shown in Fig Q3B, switch is moved from position 'A' to position 'B' at t=0. Prior to switching, circuit had attained steady state. Determine $v_c(t)$ and i(t) for t >0 using time domain analysis. ***(03)***

**3C.** For the circuit shown in Fig Q3C, find $i_2(t)$ after the switch is closed at t=0, using time domain analysis. ***(04)***

**4A.** In the network shown in Fig Q4A, the switch 'K' is moved from position 'A' to 'B' at t =0 (steady state existing in position 'A' before t = 0). Solve for the current i(t), using Laplace Transformation method. ***(03)***

**4B.** For the circuit shown in Fig Q4B, find v(t) for $e(t) = 2e^{-3t}u(t)$ using Convolution integral. ***(03)***

**4C.** Determine the T parameters for the overall network shown in Fig Q4C. ***(04)***

**5A.** In the network shown in Fig Q5A, switch 'K' is opened at t=0 after the network has attained a steady state with the switch closed. (a) Find an expression for the voltage across the switch at t = $0^+$. (b) If the parameters are adjusted such that i($0^+$)=1 and $\frac{di(0^+)}{dt} = -1$, what is the value of the first derivative of the voltage across the switch? ***(02)***

**5B.** For the function below, find the residues by pole-zero plot and hence find i(t).

$$I(s) = \frac{5(s+1)(s+2)}{s(s^2+4)}$$ ***(03)***

**5C.** Find the Y parameters for the resistive network shown in Fig Q5C. Hence, derive h parameters from the obtained Y parameters. ***(05)***

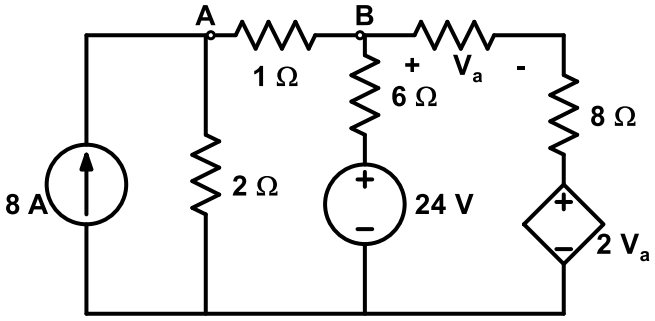

Fig Q1A

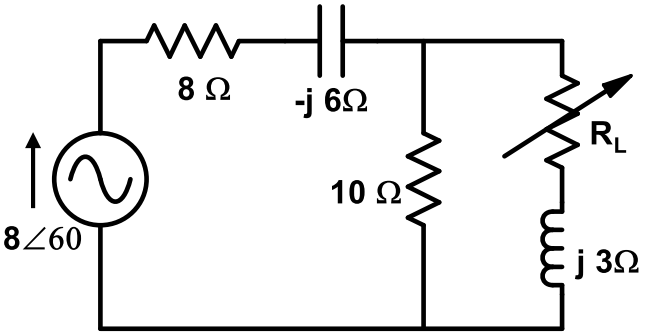

Fig Q1B

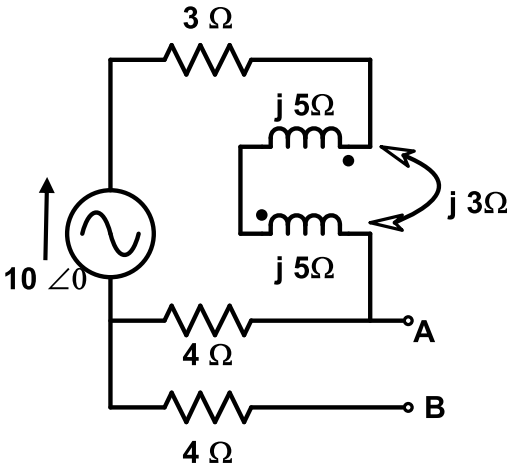

Fig Q1C

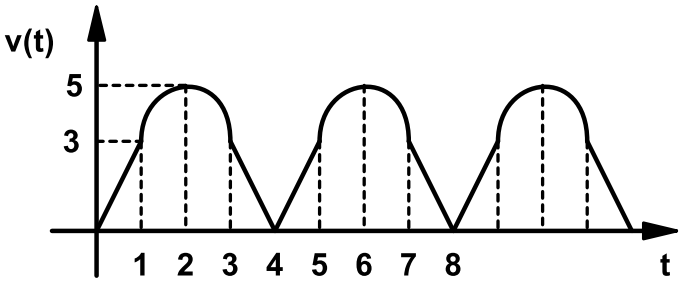

Fig. Q2A

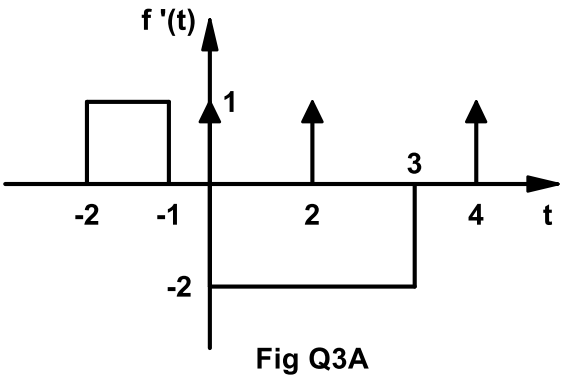

Fig Q3A

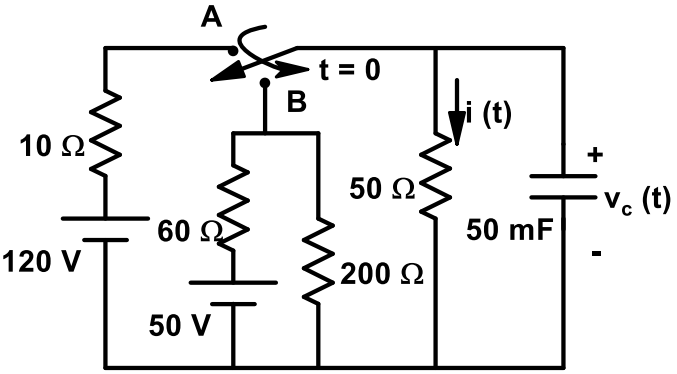

Fig 3B

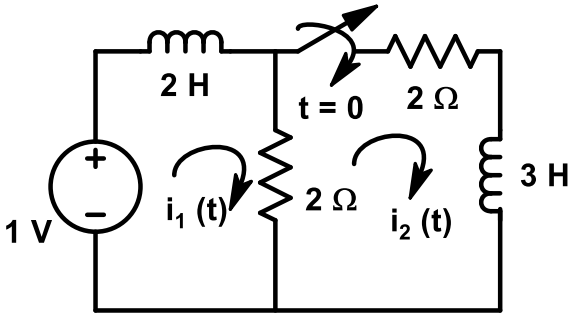


Fig Q3C

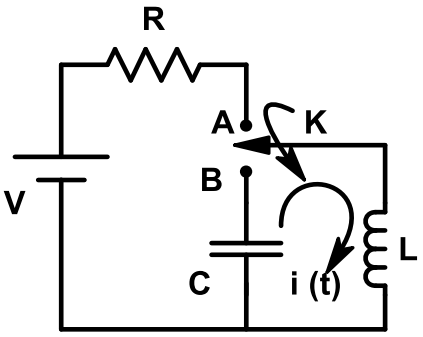


Fig Q4A

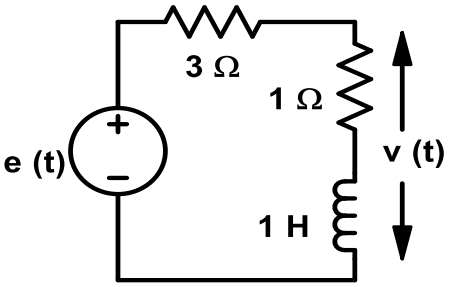


Fig 4B

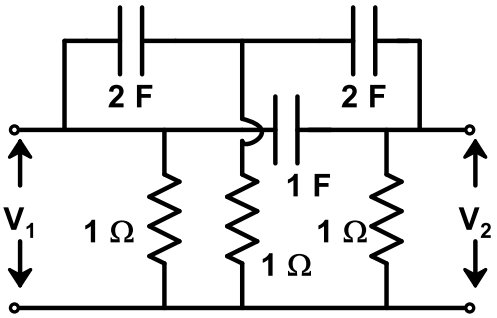


Fig Q4C

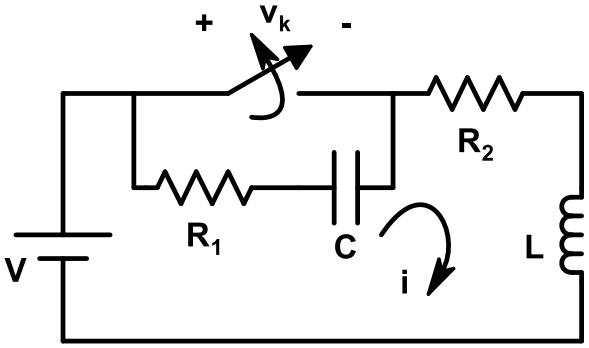


Fig Q5A

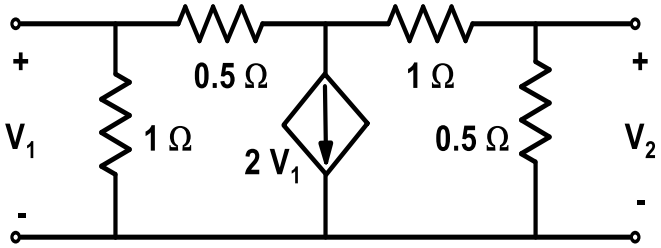


Fig Q5C