Ng Chi Hun 1155116317

Fundamentals of Electric Circuits (ELEG2202A)

HW1

Q1. (12 pts)

The total charge entering a terminal is given by q = 5t sin(4πt) mC (millicoulomb). Calculate the current at t = 0.5 s.

Q2. (13 pts) Solve for the current flowing through the 8-Ω resistor in Fig.1.

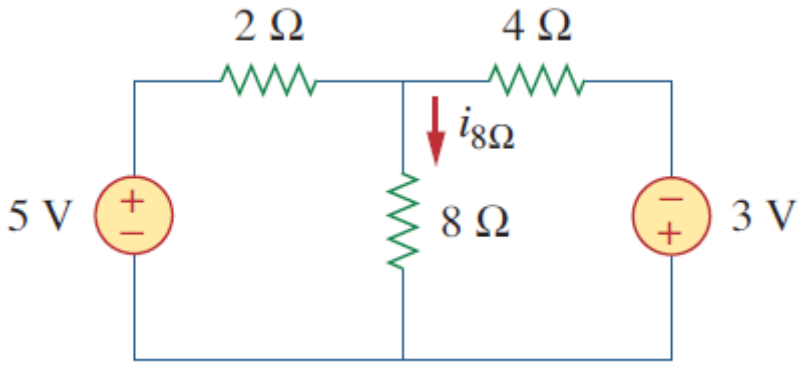

Fig.1

Q3. (20 pts) Find R_{ab} for the circuit shown in Fig.2.

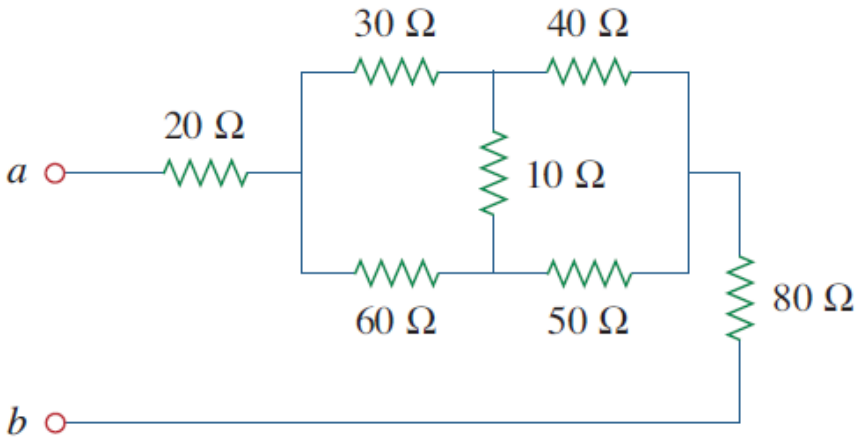

Fig.2

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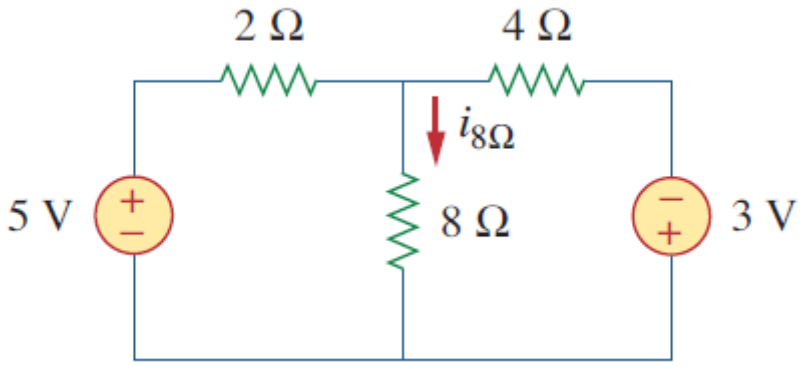


Fig.1

Q3. (20 pts) Find R_{ab} for the circuit shown in Fig.2.

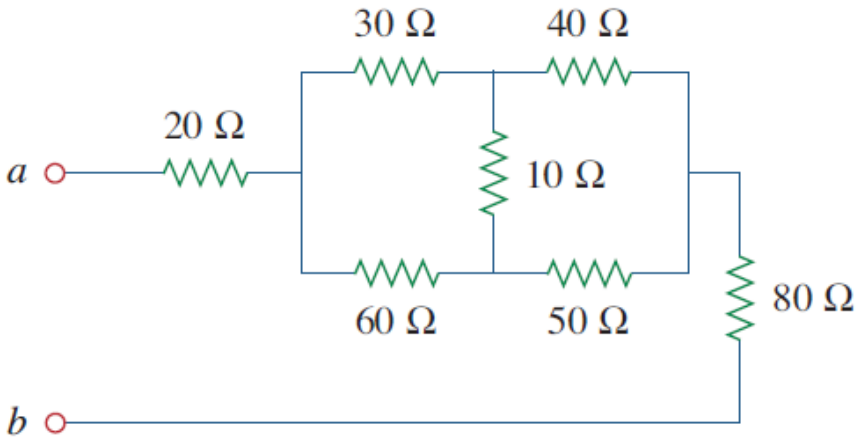


Fig.2

Q4. (25 pts) Find the equivalent resistance R_{ab} in the circuit of Fig.3.

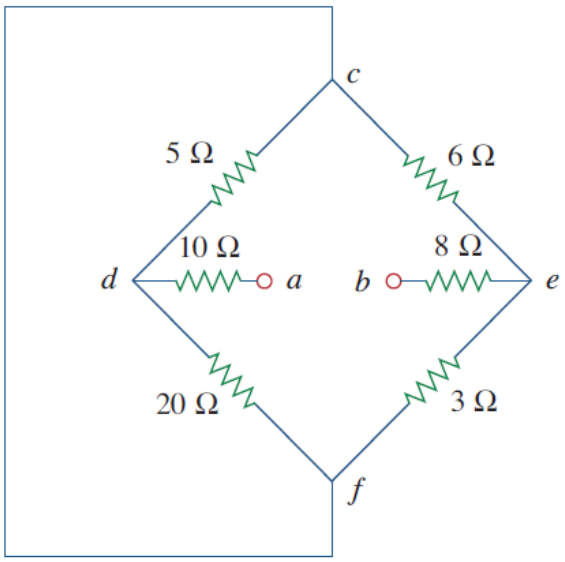


Fig.3

Q5. (30 pts) A network consisting 5 resistors (R1 − R5) is connected to a voltage source through two terminals a and b (Fig. 4).

1. Calculate the equivalent resistance of R_{ab}.

2. Calculate the power supplied by P_1.

3. If define the current direction of I as entering the positive terminal of P1, find the value of I.

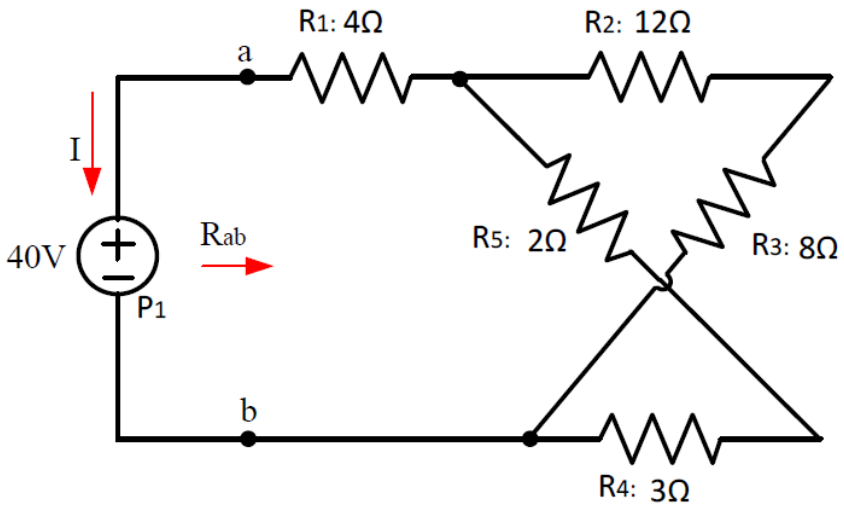
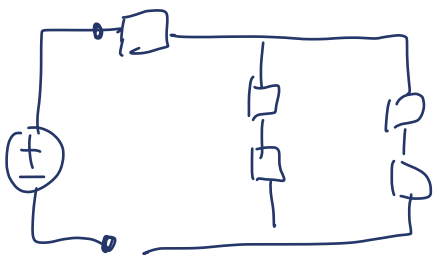


Fig.4



Q1. (12 pts)

The total charge entering a terminal is given by q = 5t sin(4πt) mC (millicoulomb). Calculate the current at t = 0.5 s.

$I(t) = \frac{d}{dt}(q(t))$

$= \frac{d}{dt}(5t \sin(4\pi t))$

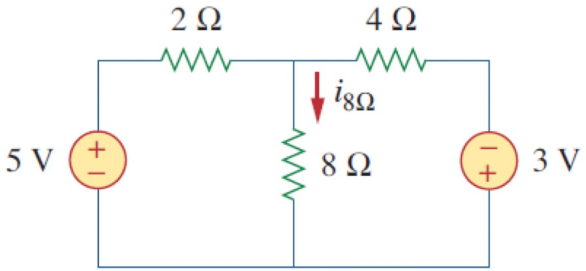
$= 5(\sin(4\pi t) + 4\pi t \cos(4\pi t))$

$\therefore I(0.5) = 31.7744 \text{ mA}$ //

Q1. (12 pts)

Q2. The total charge entering a terminal is given by q = 5t sin(4πt) mC esistor in Fig.1.

(millicoulomb). Calculate the current at t = 0.5 s.



250mA

Fig.1

Let $V_{8\Omega}$ be the voltage at the node between 1kΩ and 4kΩ

$\frac{5 - V_{8\Omega}}{2} + \frac{-3 - V_{8\Omega}}{4} = \frac{V_{8\Omega}}{8}$

$20 - 4V_{8\Omega} - 6 - 2V_{8\Omega} = V_{8\Omega}$

$14 = 7V_{8\Omega}$

$V_{8\Omega} = 2$

$\therefore i_{8\Omega} = \frac{2}{8}$

$= 250 \text{ mA}$ //

Q3. (20 pts) Find R_{ab} for the circuit shown in Fig.2.

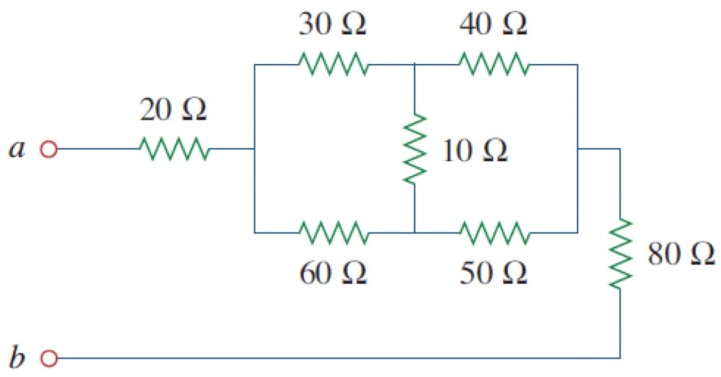


Fig. 2

$R_{a,n} = \frac{40 \cdot 10}{40+10+50} = 4\Omega$

$R_{b,n} = \frac{10 \cdot 50}{40+10+50} = 5\Omega$

$R_{c,n} = \frac{40 \cdot 50}{40+10+50} = 20\Omega$

$\therefore R_{ab} = 20 + 80 + 20 + (30+4) \| (60+5) = 142.32\Omega$ //

Q4. (25 pts) Find the equivalent resistance R_{ab} in the circuit of Fig.3.

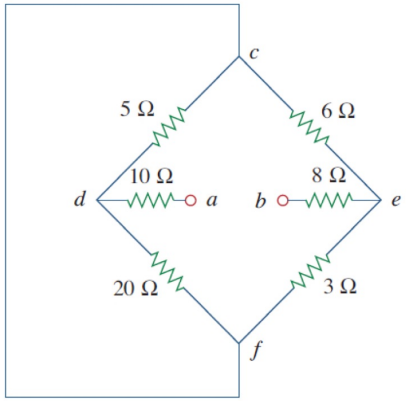


Fig.3

Q4)

$5 \| 20 = \frac{5 \times 20}{25} = 4\ \Omega$

$6 \| 3 = \frac{6 \times 3}{9} = 2\ \Omega$

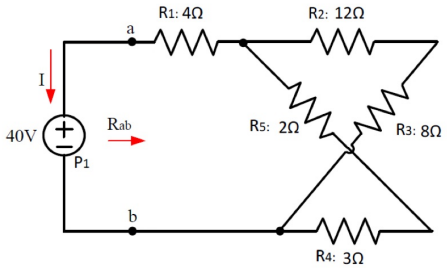
$\therefore R_{ab} = 10 + 4 + 2 + 8 = 24\ \Omega$ //

Q5. (30 pts) A network consisting 5 resistors (R1 − R5) is connected to a voltage source through two terminals a and b (Fig. 4).

1. Calculate the equivalent resistance of R_{ab}.

2. Calculate the power supplied by P_1.

3. If define the current direction of I as entering the positive terminal of P1, find the value of I.



1) R_2 and R_3 in series!

$12+8 = 20\,\Omega$

R_5 and R_4 in series

$2+3 = 5\,\Omega$

$(R_2+R_3) \,//\, (R_5 \text{ and } R_4) = \frac{20\times 5}{20+5} = 4\,\Omega$

$\therefore R_{ab} = 4+4 = 8\,\Omega$ //

2) Power Supplied $= \frac{V^2}{R} = \frac{40^2}{8} = 200W$ //

3) Current $= \frac{200}{40} = 5A$

$\therefore$ I is $-5A$ with direction