Sohag University
Faculty of Engineering
Electrical Engineering Department

Electric Circuits Theory (2)
Second Year
SHEET NO 2

Q1: The switch in the circuit in Fig.P1 has been closed for a long time before opening at t=0.

a) Find $i_1(0^-)$ and $i_2(0^-)$.
b) Find $i_1(0^+)$ and $i_2(0^+)$.
c) Find $i_1(t)$for $t \geq 0$.
d) Find $i_2(t)$for $t \geq 0^+$.
e) Explain why $i_2(0^-)$ not equal $i_2(0^+)$

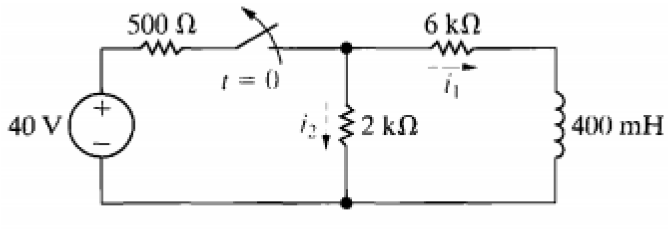

Fig.P1

Q2) The switch in the circuit in Fig.P2 has been in Position a for a long time and v_2=0V.At t=0, the switch is thrown to position b. Calculate

a) i,v_2 and v_1 for t $t \geq 0^+$.
b) The energy stored in the capacitor at t=0.
c) The energy trapped in the circuit and the total energy dissipated in the 25k Ω resistor if the switch remains in position b indefinitely.

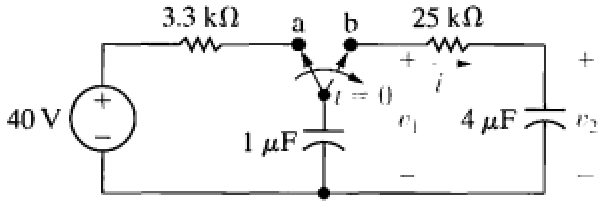

Fig.P2

Q3) The switch in the circuit shown in Fig.P3. has been closed for a long time before opening at t=0.

a) Find the numerical expressions for $i_L(t)$and $v_0(t)$ for $t \geq 0$.
b) Find the numerical values of $v_L(0^+)$and $v_0(0^+)$.

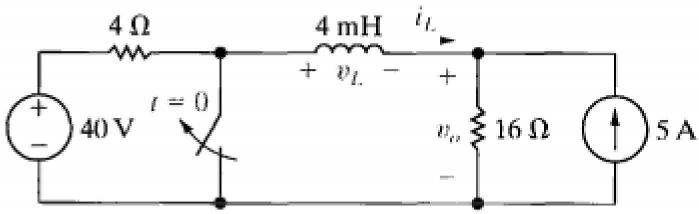

Fig.P3

Q4) Assume that the switch in the circuit of Fig.P4 has been in position a for a long time and that at t=0 it is moved to position b. Find

a) $v_c(0^+)$ b) $V_c(\infty)$ c) τ for t >0 d) $i(0^+)$ e) v_C ,$t \geq 0$ f) i ,$t > 0^+$

Q5) The action of the two switches in the circuit seen in Fig.P5 is as follows. For t<0, switch 1 is in position a and switch 2 is open. This state has existed for a long time. At t=0, switch 1 moves instantaneously from position a to position b, while switch 2 remains open. Ten milliseconds after switch 1 operates, switch 2 closes, remains closed for 10 ms and then opens. Find $v_0(t)$ 25 ms after switch 1 moves to position b.

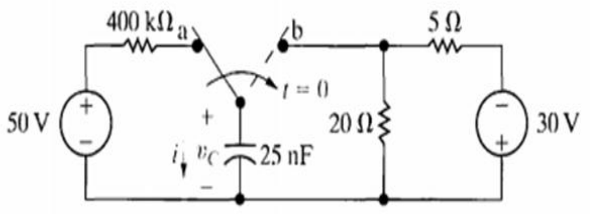

Fig.P4

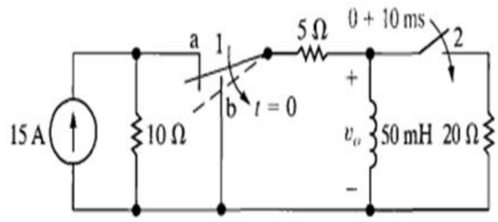

Fig.p5

Q6) The switch in the circuit in Fig.P6 has been Closed for a long time. The maximum voltage rating of the 1.6 μF capacitor is 14.4 kV .How long after The switch is opened does the voltage across the Capacitor reach the maximum voltage rating?

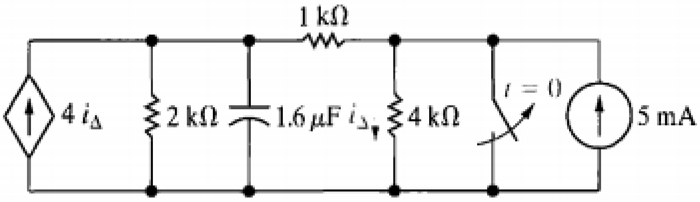

Fig.P6

Q7) The voltage source in the circuit in Fig.P7 (a) is generating the triangular wave form shown in Fig .P7(b) Assume the energy stored in the capacitor is zero at t=0 and the op_amp is ideal.

a) Derive the numerical expressions for $v_o(t)$for the following time intervals : 0<t<1μs; 1μs<t<3μs; and 3μ s<t<4μs
b) Sketch the output wave form between 0 and 4μs.
c) If the triangular input voltage continues to repeat Itself for t>4μs,what would you expect the Output voltage to be? Explain.

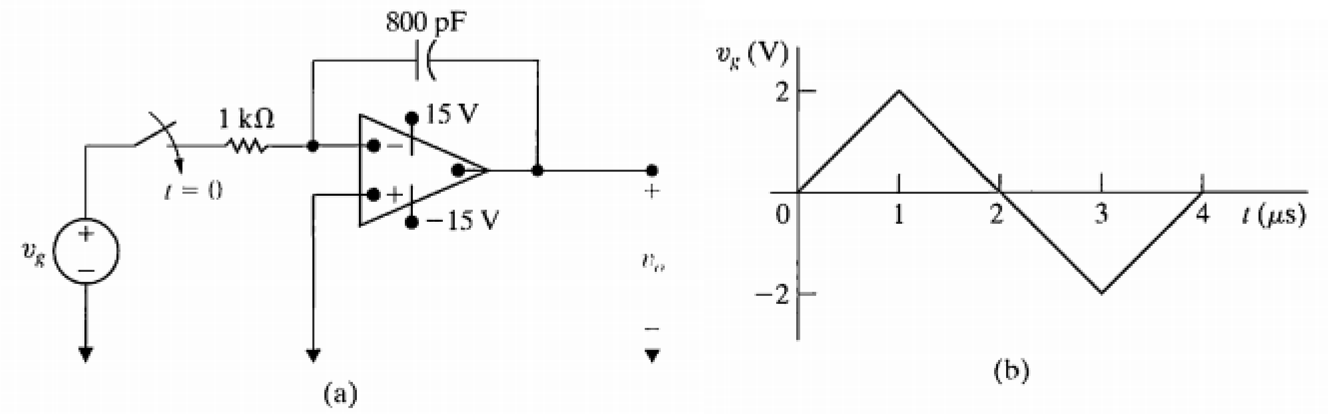

Fig.P7

Q8) At the time the double-pole switch in the circuit Shown in Fig.P8 is closed, the initial voltages on the capacitors are12V and 4V, as shown. Find the numerical expressions for $v_2(t)$,$v_o(t)$, and $v_f(t)$ that are applicable as long as the ideal op_amp operates in its linear range.

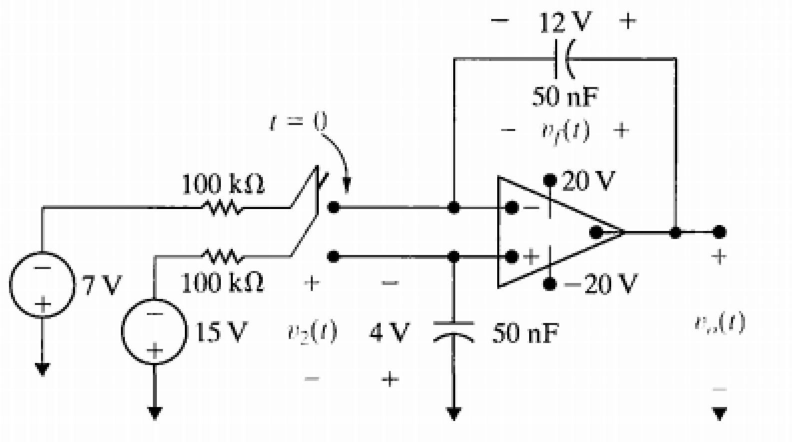

Fig.P8

Q9) The switch in the circuit shown in Fig.P9 has been in the OFF position for a long time. At t=0, The switch moves instantaneously to the ON position. Find $v_o(t)$ for t ≥0.

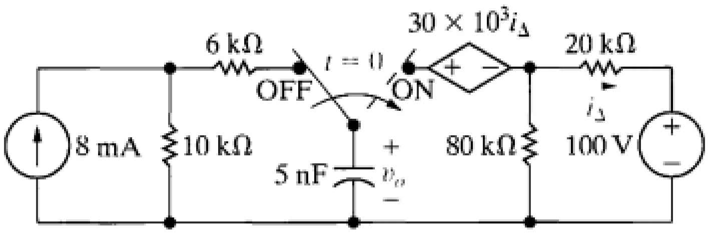

Fig.P9