**King Saud University** **EE 212: Electric Circuits**

College of Engineering **Mid Term-2 Exam:** **2nd Semester 1435-1436H**

Electrical Engineering Department **Time allowed: 1.5 hours**

**Student Name: _____**

**ID # _____**

## Question 1:

For the circuit shown in **Fig.1**, the switch has been open for a long time. It is closed at $t = 0$.

Find:

(a) $V_C(0^+)$

(b) $I_L(0^+)$

(c) $I_C(0^+)$

(d) $V_C(t)$ for $t > 0$

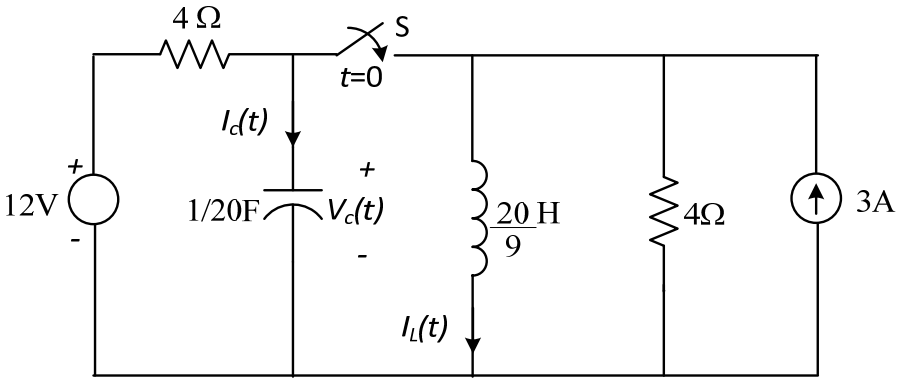


**Fig. 1**

**Question 2:**

In the circuit shown in **Fig. 2**, the switch has been closed for a long time. It is opened at time $t$=0. Find:

(a) $V_C(0^+)$
(b) $I_L(0^+)$
(c) $V_L(0^+)$
(d) $I_L(t)$ for $t$>0

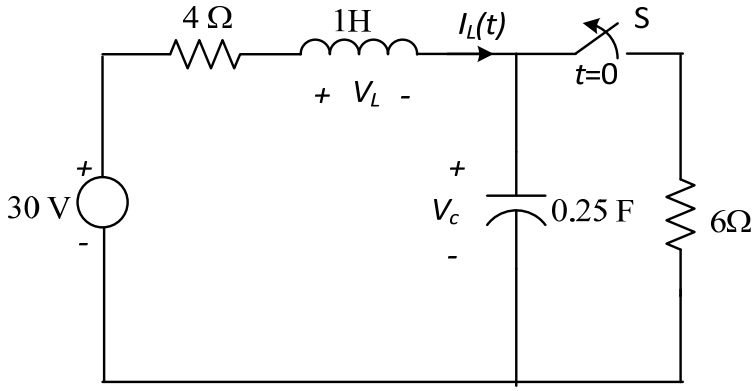


**Fig. 2**

**Question 3:**

For the circuit shown in **Fig. 3,** find

(a) The open circuit voltage $V_{ab}$
(b) Short circuit current $I_{ab}$
(c) Thevenin's impedance $Z_{th}$ at terminals a, b

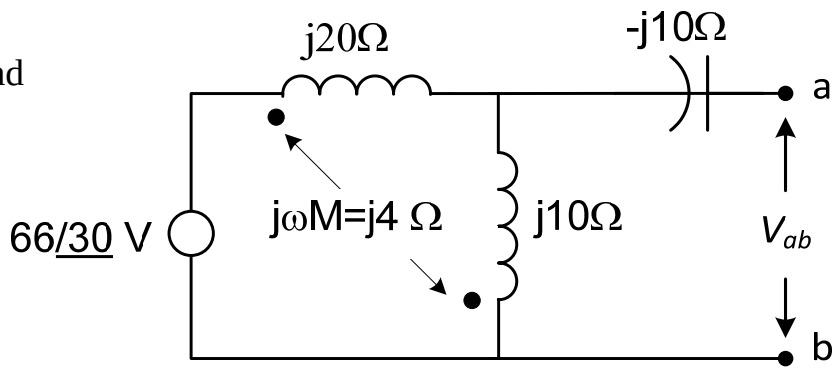


**Fig. 3**

**Question 4:**

The series *RLC* circuit shown in **Fig. 4** is used as a band-pass filter, if the upper cut-off frequency $\omega_2$ =1000 rad/s, find

a) Inductance *L*
b) Resonance frequency $\omega_0$
c) Lower cut-off frequency $\omega_1$
d) Bandwidth $\beta$
e) Quality factor *Q*

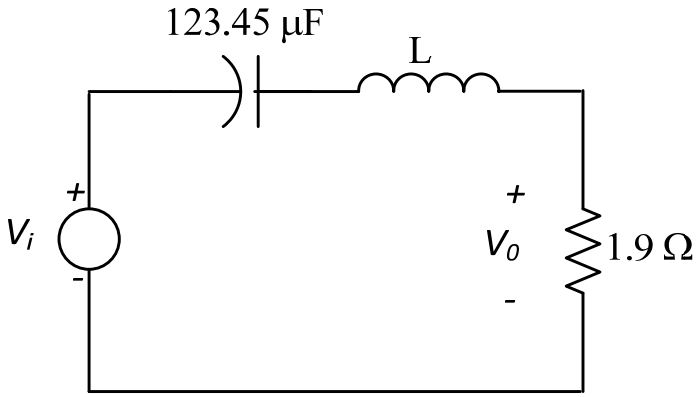


**Fig. 4**

**Question 5:**

For each circuit shown in **Fig. 5a** and **Fig. 5b**.

(a) Find the transfer function $H(\omega) = \frac{V_o}{V_S}$

(b) Name the type of filter which each circuit represents.

(c) Find the cut-off frequency in each case.

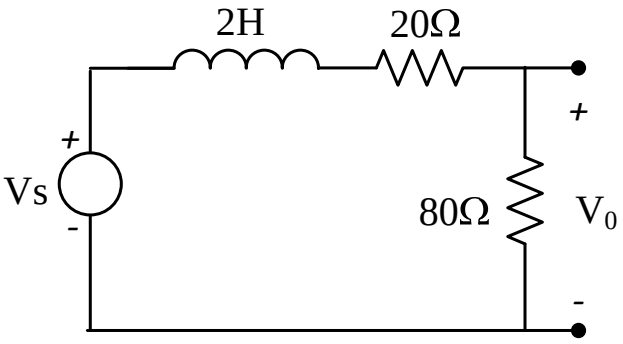


**Fig 5(a)**

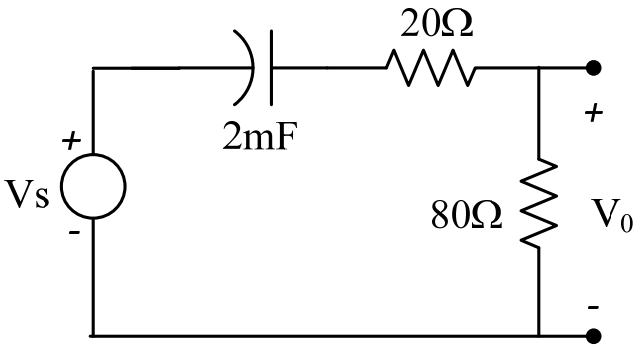


**Fig 5(b)**

**Question 6:**

In the circuit shown in **Fig. 6**,

(i) Find the transfer function $H(s) = \frac{V_0}{I_s}$

(ii) Find the numerical values of poles and zeros of H(s).

(iii) Find the values of *a*,*b*,*c* and *K*, if $H(\omega)$ is expressed as

$$H(\omega) = \frac{K\,(1+\frac{j\omega}{a})}{\left(1+\frac{j\omega}{b}\right)(1+\frac{j\omega}{c})}$$

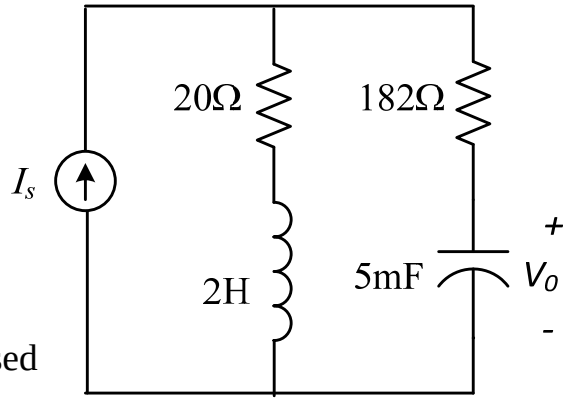


**Fig. 6**