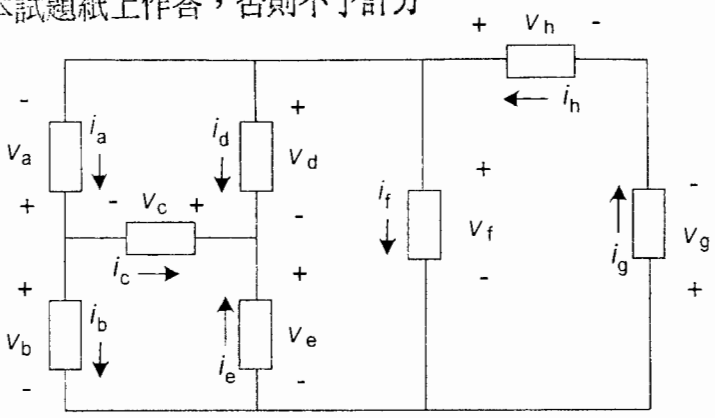
系所組別：系統及船舶機電工程學系丁組

考試科目：電路學　　考試日期：0223，節次：2

※ 考生請注意：本試題不可使用計算機　請勿在本試題紙上作答，否則不予計分

Problem #1: (16 points)

Use the table and circuit diagram to answer the following questions. The column labeled PSC represents whether the passive sign conversion (PSC) is satisfied for each circuit element.



(i) Fill in the missing values in the table (9 pts)

	Voltage (V)	Current (A)	PSC (Yes/No)	Power (W)
a		3		24
b	7			
c	-12	3		
d	20	-5		
e		2		10
f	15			-30
g	-10			
h	5			20

(ii) Which circuit elements could be voltage sources? (Circle) (2 pts)

a b c d e f g h

(iii) Which circuit elements could be resistors? (Circle) (2 pts)

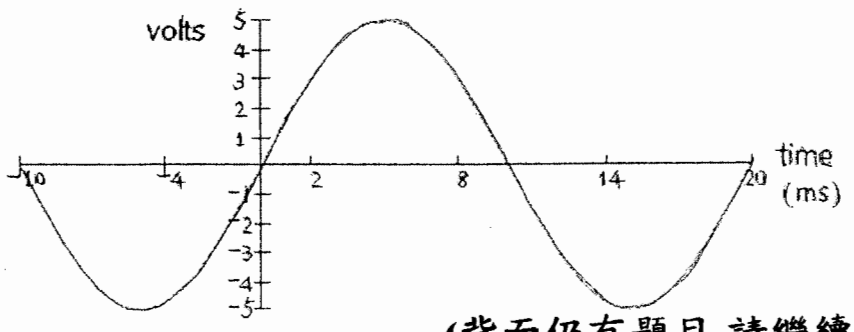
a b c d e f g h

(iv) What is the total power absorbed in the circuit. (1 pt)

(iv) How many meshes are in the circuit? (1 pt)

(v) How many essential nodes are in the circuit? (1 pt)

Problem #2 (8 points, 4 pts each) Find (a) The average, DC (V_{DC}) voltage. (b) The RMS (effective) voltage.



(背面仍有題目,請繼續作答)

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Problem #3: (16 points)

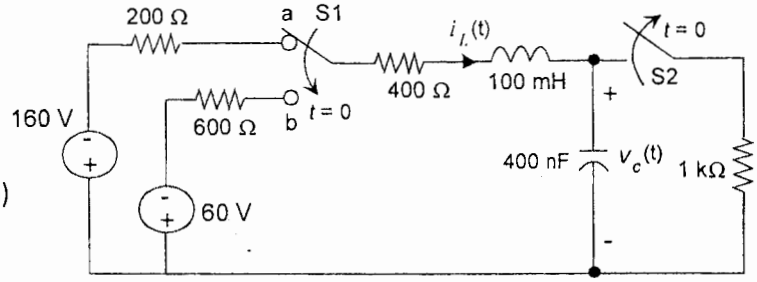
The two switches in the below figure operate synchronously. When switch S1 is in position **a**, switch S2 is closed. When switch S1 is in position **b**, switch S2 is open. Switch S1 has been in position **a** for a long time. At $t = 0$, it moves instantaneously to position **b**.

(a) Find $v_c(0)$ and $i_L(0)$. (4 pts, 2 pts each)

(b) Find $\frac{dv_c(0^+)}{dt}$ and $\frac{di_L(0^+)}{dt}$. (4 pts, 2 pts each)

(c) What is the type of the response for $t \geq 0$. (2 pts)

(d) Find $v_c(t)$ and $i_L(t)$ for $t \geq 0$. (6 pts, 3 pts each)



Problem #4: (18 points, 6 pts each) 選擇題

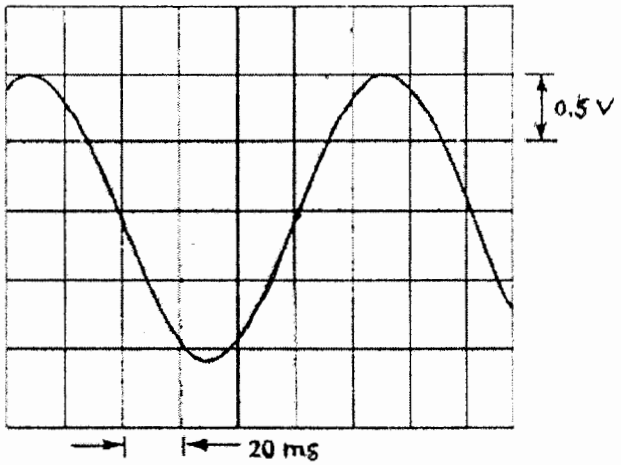
(i) The sinusoid is displayed on an oscilloscope in the right figure. The RMS voltage and radian frequency are most nearly

(A) 1, 8.33

(B) 0.7071, 53.36

(C) 1.4142, 52.36

(D) 2, 8.33



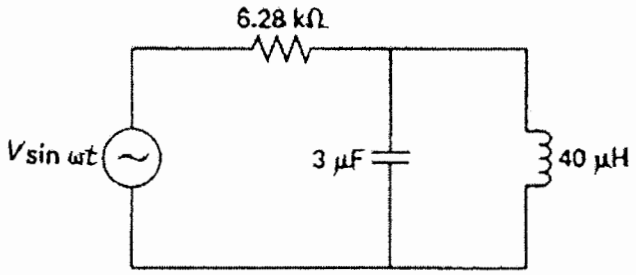
(ii) What is the resonant frequency of the circuit below?

(A) 15 kHz

(B) 29 kHz

(C) 46 kHz

(D) 91 kHz



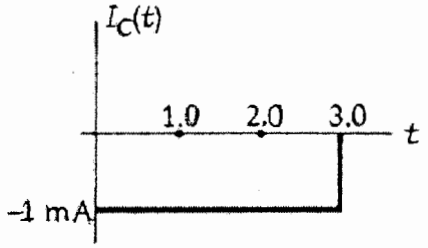
(iii) A 100 μF capacitor has $I_c(t)$ as below. The capacitor voltage $v_c(t)$ at t = 2.5 seconds (v(0) = 1.0 V) is most nearly

(A) -24

(B) -25

(C) 25

(D) 26



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Problem #5: (10 points)

A balanced, 3-phase, lagging-power-factor load has a delta-connected capacitor bank connected across it. The source voltage is 230 V (line-to-line) and the source current is 8 Amps when the capacitors are sized at 800 Vars each to make the total power factor unity (1.0). What will the line current be when the capacitors are removed?

Problem #6: (12 points, 6 pts each)

For the circuit shown in Fig. 6, find (a) the resonance frequency (b) the quality factor

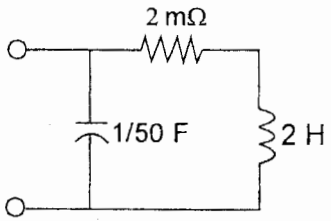

Fig. 6

Problem #7: (10 points) For the op-amp circuit shown in Fig. 7, find the transfer function **H**(s) = V_2/V_1 and draw the pole-zero plot for the case that C = 4/3 F.

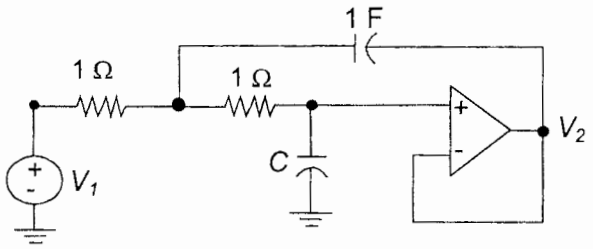

Fig. 7

Problem #8: (10 points)

For the circuit shown in Fig. 8 which uses IDEAL transformers. Find the voltage gain V_2/V_g.

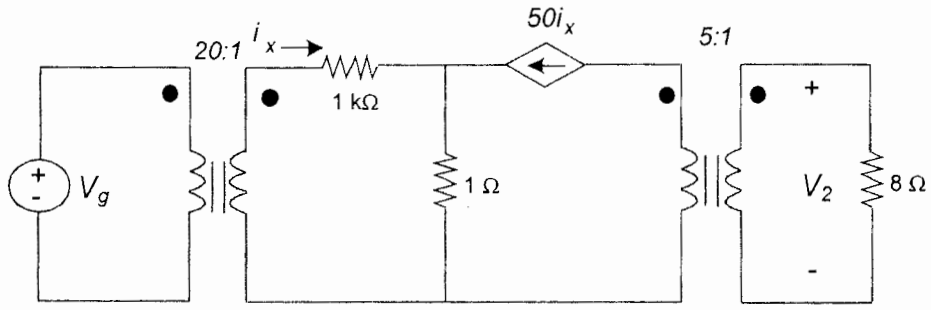

Fig. 8