

國立臺北科技大學 103 學年度碩士班招生考試

系所組別：2120 電機工程系碩士班乙組

第二節 電路學 試題

第一頁，共一頁

注意事項：

1. 本試題共 3 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Solve the following problems for the circuit shown in Fig. 1 using node voltage method: (30%)

- (1). Derive the node voltage equations with the unknown node voltages, V_1 and V_2 . (8%)
- (2). Find the node voltages V_1 and V_2 from above node equations. (8%)
- (3). Find the branch currents: I_1 , I_2 , I_3 and I_4 . (8%)
- (4). Calculate the supply power of each source. (6%)

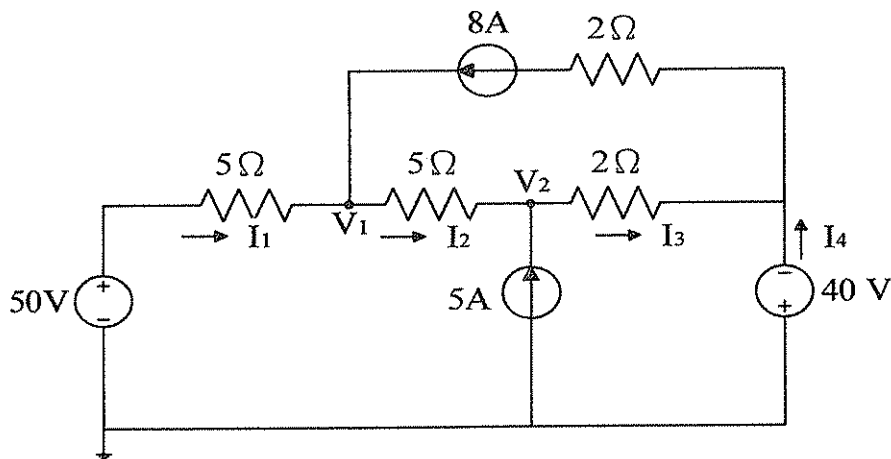


Fig. 1

2. Solve the following problems for the sinusoidal steady state circuit shown in Fig. 2 using phasor method: (40%)

- (1). Construct the phasor circuit (frequency domain equivalent circuit). (*note: all the sources are presented by r.m.s. phasors.*) (7%)
- (2). Derive the node voltage equations based on phasor circuit. (6%)
- (3). Find the phasors of node voltages and branch currents: V_1 , V_2 , I_1 , I_2 , I_3 , and I_4 . (12%)
- (4). Find the time domain node voltages and branch currents: v_1 , v_2 , i_1 , i_2 , i_3 , and i_4 . (9%)
- (5). Calculate the supply complex power of each source. (6%)

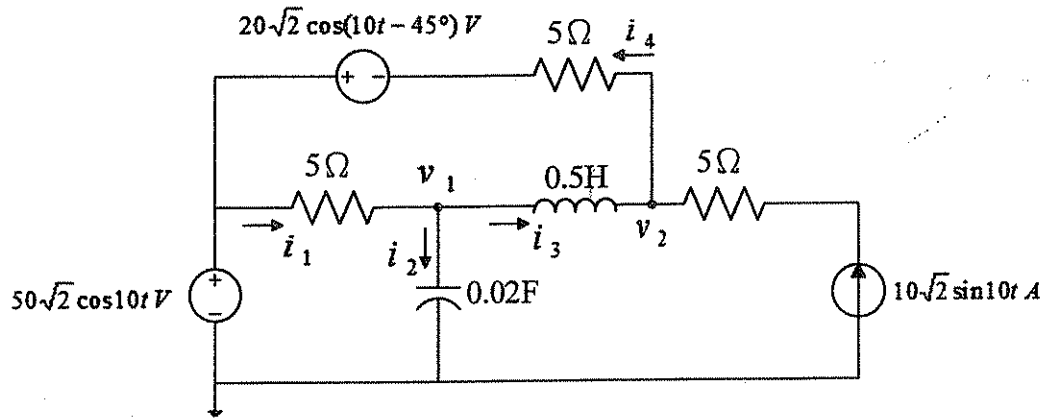
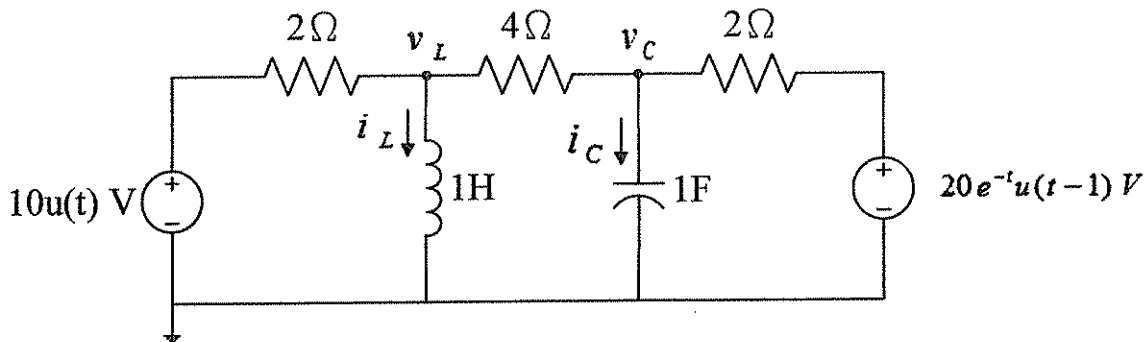


Fig. 2

3. Solve the following problems for the circuit shown in Fig. 3 using Laplace transform method: (30%)

- (1). Construct the Laplace transform circuit (s-domain equivalent circuit), (8%)
- (2) Derive the Laplace transform expressions (s-domain expressions) for the node voltages V_L , I_L , V_C and I_C . (8%)
- (3) Find the time domain expressions for v_L , i_L , v_C and i_C , for $t \geq 0$. (8%)
- (4) Compute the steady state values of i_L and v_C . (6%)



$$i_L(0) = 0 \text{ A} \quad v_C(0) = 0 \text{ V}$$

Fig. 3