

Final Examination

Notice: Please turn off any types of handheld devices, and leave them far from reach. Use only standalone calculators for calculation if it is needed. The examination takes 100 minutes. 只准帶回答案紙，題目紙請同學保留。

1. (11%) Given a circuit of noninverting summing amplifier in Fig. 1, show: $v_{out} = k_1 v_1 + k_2 v_2 + k_3 v_3$

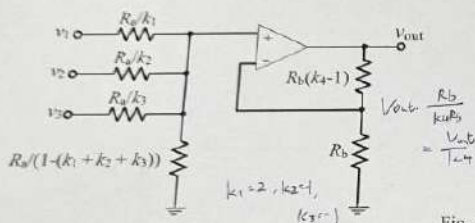


Fig. 1

2. (12%) Find v_o and i_o for the circuit shown in Fig. 2.

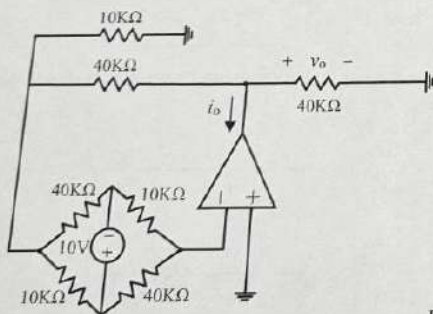


Fig. 2

3. (12%) The circuit shown in Fig. 3 consists of two parts separated by a pair of terminals. Consider the part of the circuit to the left of the terminals. The open

circuit voltage is $v_{oc} = 8V$, and short-circuit current is $i_{sc} = 2A$. Determine the values of

- (a). the voltage v_s and the resistance R_2
(b). the resistance R that maximizes the power delivered to the resistor to the right of the terminals, and the corresponding maximum power.

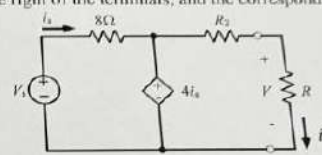


Fig. 3

4. (14%) Derive the Norton equivalence of the circuit in Fig. 4 by Norton Theorem.

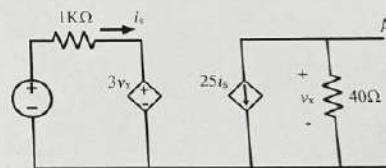


Fig. 4

5. (14%) As a practical noninverting amplifier shown in Fig. 5.1, please derive the voltage gain v_o/v_{in} of the noninverting amplifier by a finite gain model shown in Fig. 5.2.

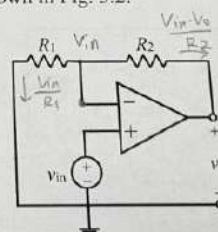


Fig. 5.1

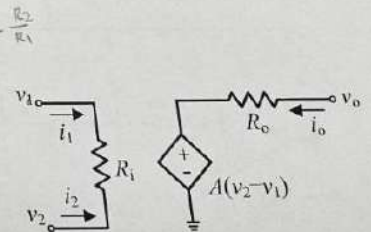
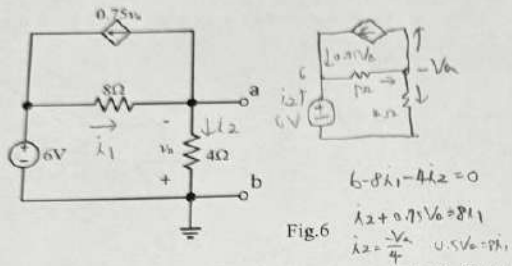
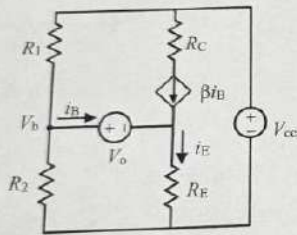


Fig. 5.2

6. (12%) Find the Thevenin equivalent circuit for the circuit shown in Fig. 6.



7. (14%) Use Thevenin equivalent circuit to find i_E in the circuit of Fig. 7. $V_a = i_{E1}$

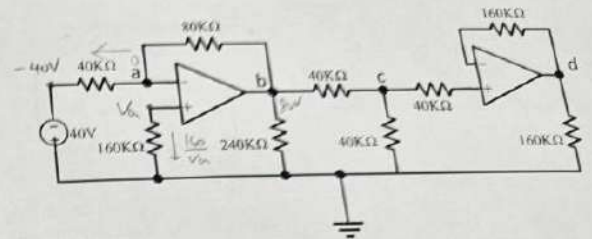


Handwritten equations:

$$6 - 0.5V_a + V_a = 0$$

$$V_a = 12$$

8. (11%) Determine the node voltages at nodes a, b, c and d of the circuit shown in Fig. 8.



Handwritten equation:

$$\frac{V_a + 40}{40}$$