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**. 只需繳回答案紙，題目紙請同學保留。

1. (11%) Given a circuit of noninverting summing amplifier in Fig. 1, show: $v_{out} = k_4(k_1v_1 + k_2v_2 + k_3v_3)$

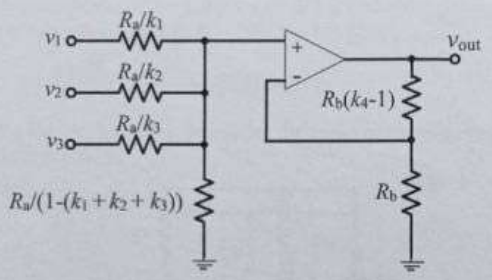

Fig. 1

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

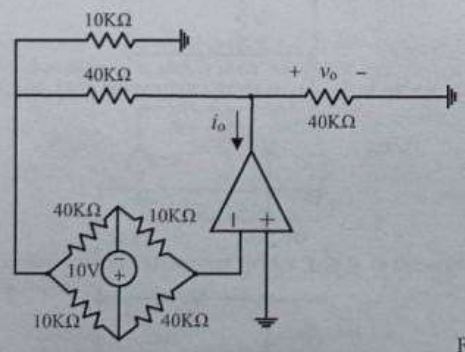

Fig. 2

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.

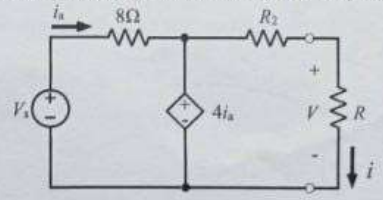

Fig. 3

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

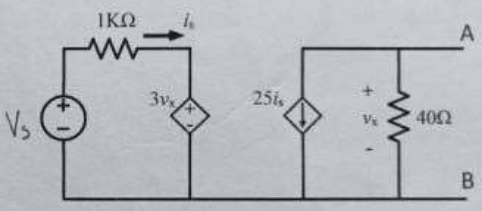

Fig. 4

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.

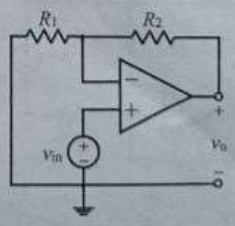

Fig. 5.1

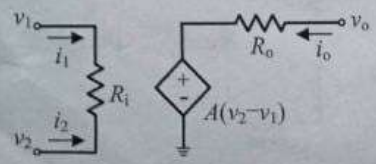

Fig. 5.2

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

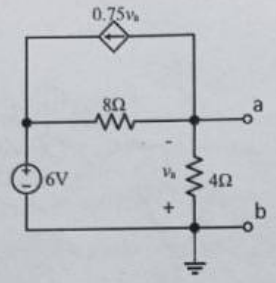

Fig.6

7. (14%) Use Thevenin equivalent circuit to find i_E in the circuit of Fig. 7.

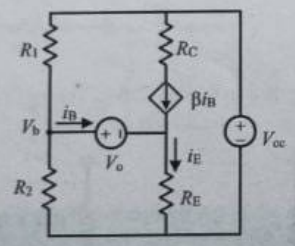

Fig. 7

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

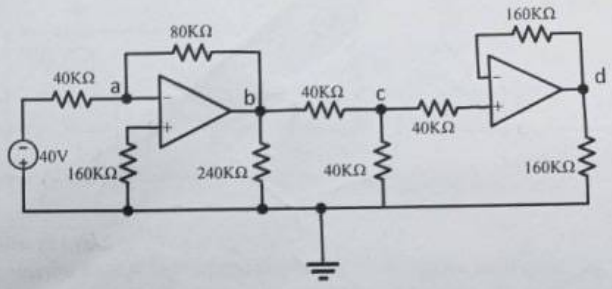

Fig. 8