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. (12%) In the circuit shown Fig. 1, the output is the current in the 10Ω resistor i_o. Determine the values of the resistance R_1 and of the gain of dependent source G that cause both the value of voltage across the 12Ω to be $v_a = 10.38V$ and the value of the output current to be $i_o = 0.4151A$.
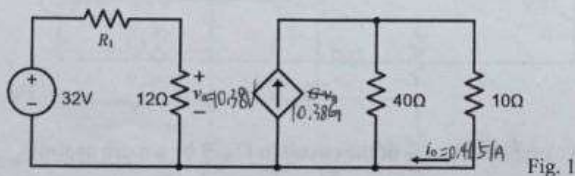

Fig. 1

2. (10%) Determine the values of the node voltages, v_1, v_2, v_3, and v_4, of the circuit shown in Fig. 2 by a nodal analysis.
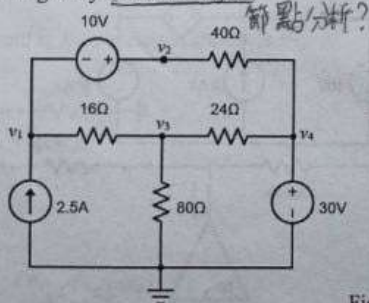

Fig. 2

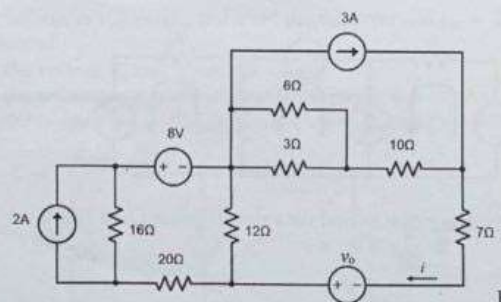3. (10%) Find v_o using source transformations if $i = 5/2A$ in the circuit shown in Fig. 3.

Fig. 3

4. (12%) The voltages v_2, v_3 and v_4 for the circuit shown in Fig. 4 are $v_2 = 16V$, $v_3 = 8V$, and $v_4 = 6V$. Determine the values of the following:
   (a) The gain, A, of the VCVS.
   (b) The resistance R_5.
   (c) The currents i_b and i_c.
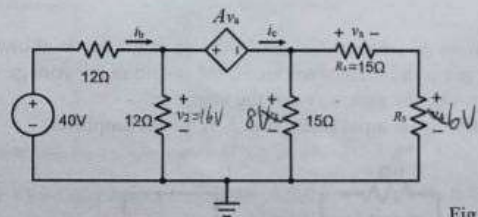   (d) The power received by resistor R_4.

Fig. 4

5. (12%) The mesh currents are labeled in the circuit shown in Fig. 5. The values of these mesh current are $i_1 = -1.1014A$, $i_2 = 0.8986A$ and $i_3 = -0.2899A$:
   (a) Determine the values of the resistance R_1 and R_3.
   (b) Determine the values of the current source current.
   (c) Determine the values of the power supplied by the 12V voltage source.
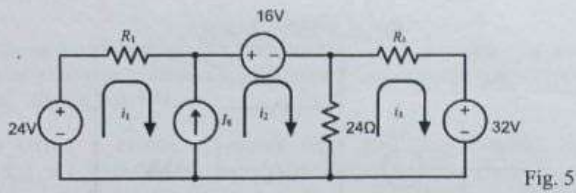
Fig. 5

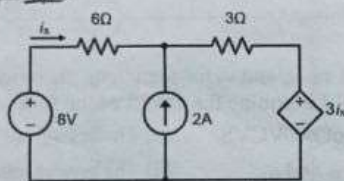6. (10%) Use superposition to find the value of current i_x in Fig. 6.
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Fig.6

7. (12%) A circuit of small signal model of an amplifier is shown in Fig. 7. While the input is the voltage source v_s, the output is the voltage v_o.
  (a) Determine the gain, v_o/v_s, of the amplifier.
  (b) Determine the input resistance, i_b/v_s, of the amplifier.
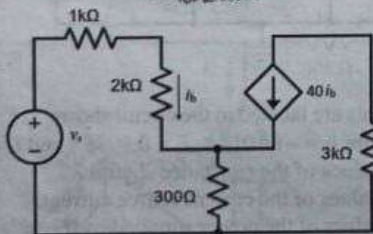   conductant

Fig. 7

8. (10%) Determine the values of the node voltages v_1, v_2 and v_3 in the circuit in Fig. 8.
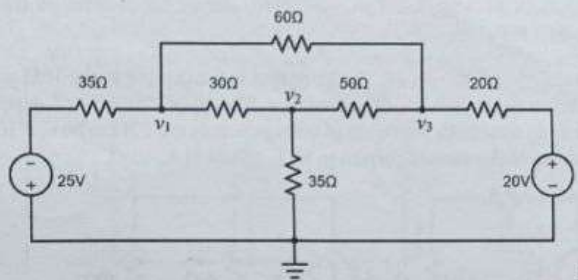

Fig. 8

9. (12%) Compute i_a and i_b of the circuit in Fig. 9 by a mesh analysis.

Fig. 9