電子、電路及工程力學

1. (15%) Fig. 1 shows a two-stage FET amplifier using two identical FET's. If the simplified model parameters of FET are: g_m = 0.002 A/V, r_d = 100 K Ohms, solve the followings.

   (a) Find the equivalent circuit representing by the simplified model parameters.
   (b) Calculate the overall voltage gain, $A_V = V_o/V_i$.
   (c) Estimate the phase difference between V_o and V_i.

2. (15%) Fig. 2 shows a simple transistor circuit with characteristic curves obtaining from experiments.

   (a) Sketch the load line with Q point on the curve chart.
   (b) Estimate the approximate current gain, h_{fe}, of this transistor.
   (c) Describe what is the purpose to apply capacitors C_1 and C_2 in this amplifier.

3. (10%) Fig. 3 shows a DC circuit with two dependent sources $6V_o$ and $4I$. Use any methods to solve the node voltages V_1, V_2 and V_3 as shown in this circuit.

   ** The formulations and soultions should be examined correctly to earn the score.

4. (15%) Fig. 4 shows a DC circuit with multiple sources. Use any methods to solve the Equivalent Theven's Circuit referring to the 5 Ohm load.

5. (5%) Fig. 5 shows a partial circuit of a transformer. According to Lenz's Law and Ampere's Right Hand Law, specified the following terms and sketch on the circuit. In this circuit, L_1 is specified as its primary coil, L_2 is specified as its secondary coil, M_{12} is specified as the mutual inductance of two coils. i_1 is the excitation current of the primary with applied voltage v_{11}.

   (a) Mark the linkage flux ϕ_{12}, and leakage flux ϕ_{11},
   (b) Mark the direction of the induced secondary current i_2, with polarity of e_{12},
   (c) Place a dot on the secondary coil, onto the circuit.

注意：第一題及第五題需在圖上標示答案，或將題圖描繪於答案卷上作答。

6. The beam shown in Fig. 6 is pin connected at B and supports a triangular distributed load. Determine the reactions at the supports.

(10 %)

7. The rectangular block, which is solid and homogeneous, is supported at its corners by small rollers resting on horizontal surfaces, as shown in Fig. 7. If the supporting surface at B is suddenly removed, determine the expression for the initial acceleration of corner A.

(15 %)

8. Disk B rotates at 900 rpm relative to the turntable, which is rotating about a fixed axis at a constant rate of 300 rpm, as shown in Fig. 8. Determine the acceleration of point C on the perimeter of the disk at the instant shown using a moving coordinate system (x,y,z) that is attached to the turntable.

(15 %)

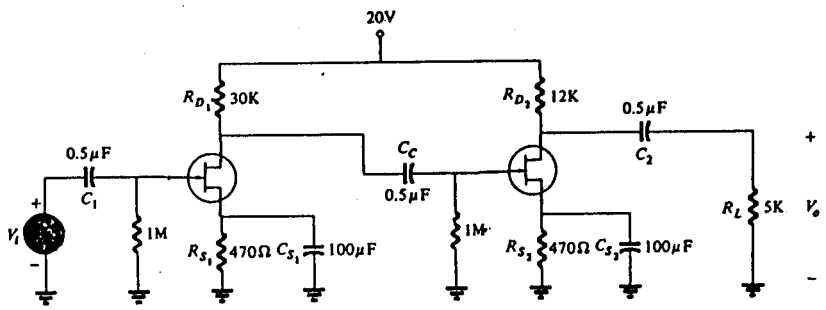

Figure 1.

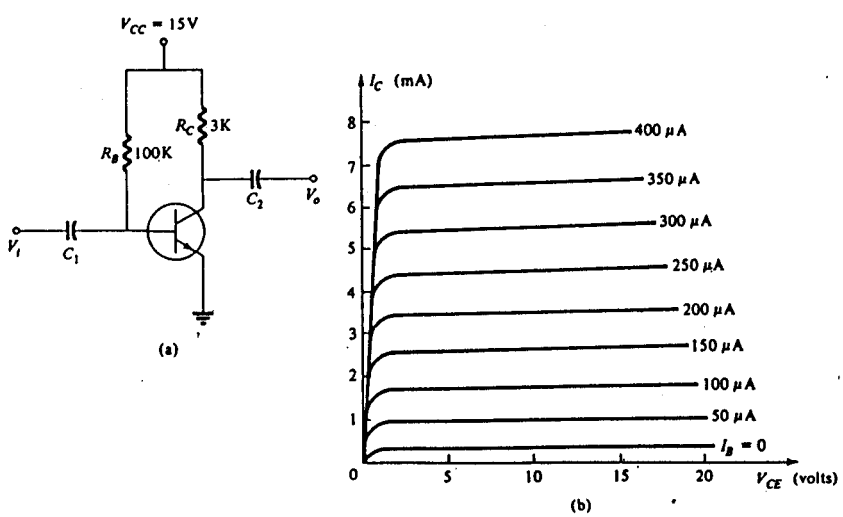

Figure 2.

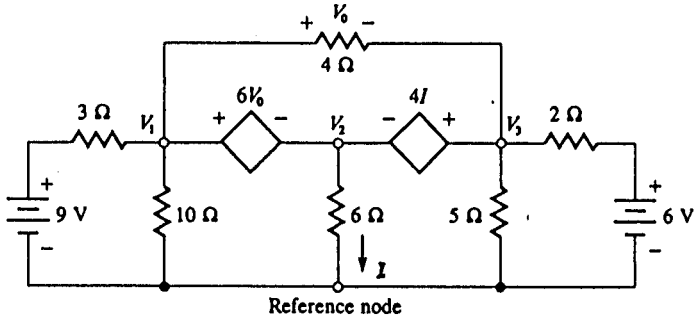

Figure 3.

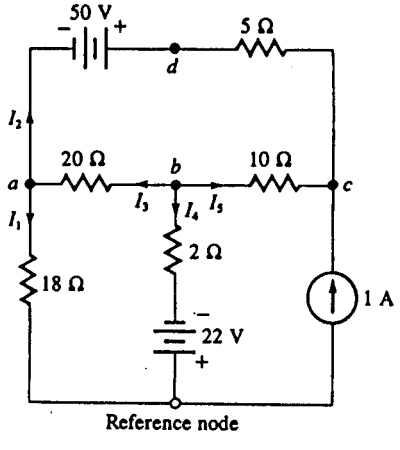

Figure 4.

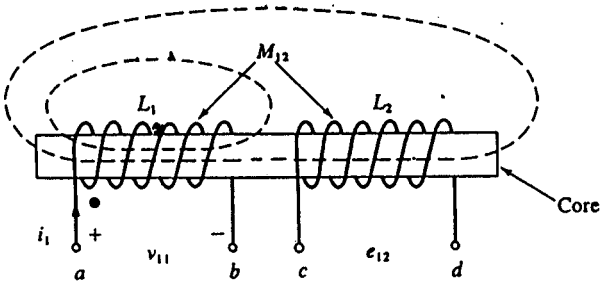

Figure 5.

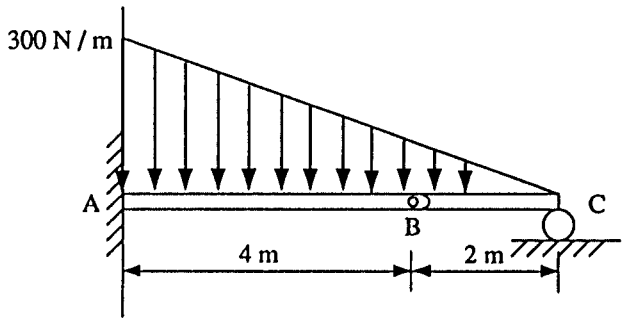

Fig. 6

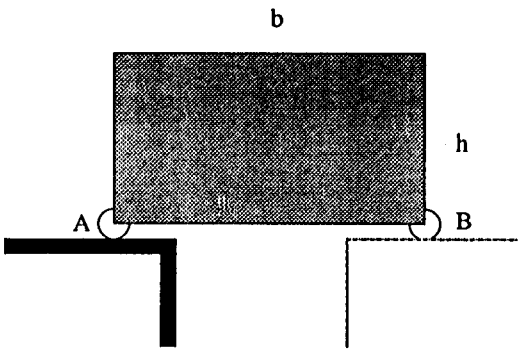

Fig. 7

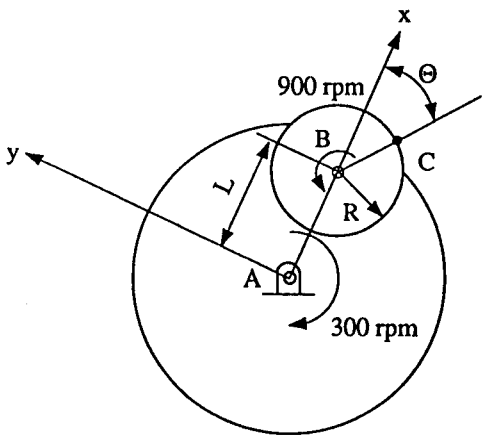

Fig. 8