(A)電子電路

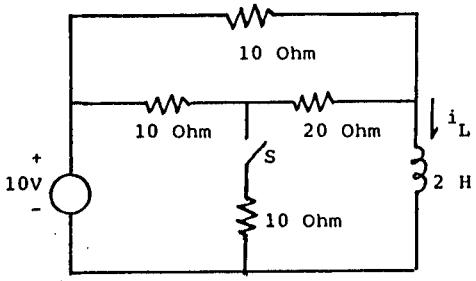

Figure 1.

1. In Figure 1, the switch S is closed at t=0. Solve the inductor current $i_L(t)$ for a time interval of $[0, \infty)$.

(10%)

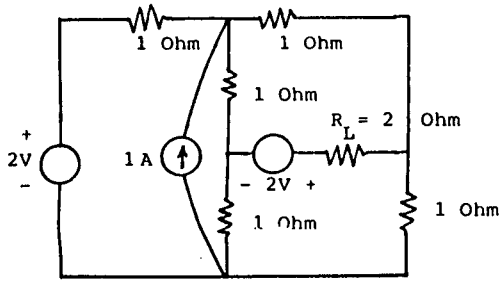

fig. 2

2. Find the Thevenin's Equivalent circuit for Figure 2 on R_L.
Note: Using superposition theorem is recommended.

(10%)

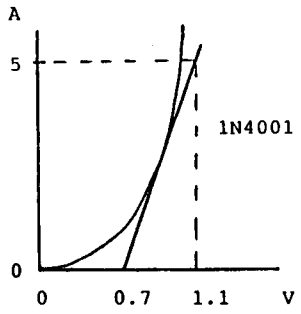

Figure 3.

3. Figure 3 shows the V-I characteristic of 1N4001 diode. An adopter is to be designed using (a) a step-down transformer, (b) a bridge diode composing of 1N4001's, (c) a filter capacitor. The specifications for this adopter is 2A maximum DC, average output voltage 6.0 VDC. for the AC input is 110 V 6o Hz.
   (a) Draw the circuit, specified each component with certain values, such as the capacitor in uF, the transformer secondary AC voltage.
   (b) Calculate the DC output voltage if output current drops from 2A to 1 A.

(15%)

Note: An adopter is possible a simple DC power supply for domestic use indoor.

4. A transistor operating at low frequency can be replaced by its h-parameter model. Assume the source voltage V_s, in series with a source resistor R_s to the transistor, and an output impedance Z_L is applied.

(a) Draw the model circuit,

(b) Derive the relationship of A_I, using h-parameters,

(c) Derive the relationship of Z_i, using the h-parameters.

(10%)

5. Brief answers to the following questions.

(a) Thermal runaway,

(b) Resonant pheonomenon,

(c) Miller effect of high frequency operation,

(d) Depletion area of a P-N junction,

(e) Negative resistance of Tunnel diode.

(15%)

(B) 工程力學

1

(a) What vertical motion must the top of a yo-yo (see Fig. 1.a) string be given to make its center stay fixed in space? What will be the force in string? (10%)

(b) The table in Fig. 1.b turns at constant speed. Write the equation of motion for the point mass with $l \neq 0$. (10%)

2 A particle P of mass m is constrained to slide without friction down a tube attached to a constantly spinning cone c as shown in Fig. 2. A constant gravitational field (down $\underline{c}_3$) is assumed. In terms of the coordinates and the constants given in Fig. 2, derive

(a) a single scalar differential equation describing the motion of the particle P. (10%)

(b) the constrained force(s) acting on the particle P. (10%)

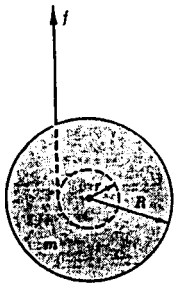

Figure 1.a

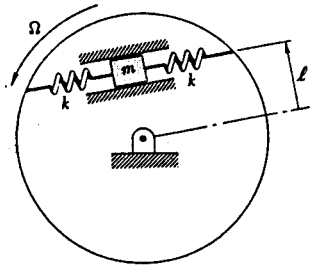

Figure 1.b

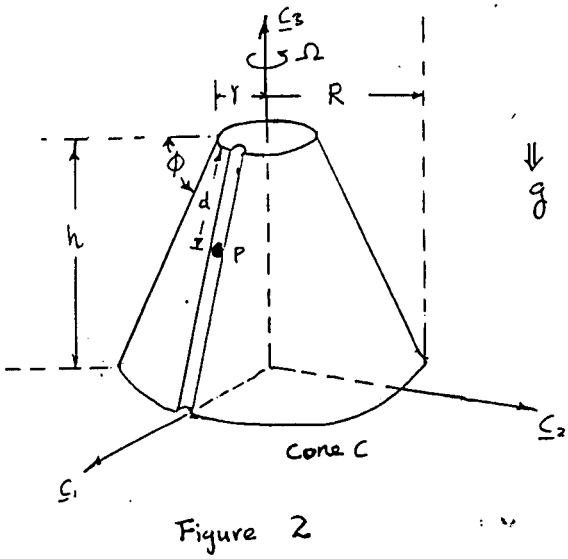

Figure 2