國立臺北大學 108 學年度日間學士班轉學生招生考試試題

學制系級：電機工程學系日間學士班 2 年級

科　　目：普通物理

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1. There is a sinusoidal transverse wave travelling along a string in the positive direction of an x axis. The displacement y of the string particle at x=0 is given in Fig. 1 as a function of time t. The scale of the vertical axis is set by y_s=0.04m. The wave equation is to be in the form $y(x,t) = y_m \sin(kx \pm \omega t + \varphi)$.
   (1) Find the parameters k, ω, and φ (9%)
   (2) Find the speed of the wave (3%)
   (3) What is the transverse velocity of the particle at x=0 when t=5.0s ? (4%)

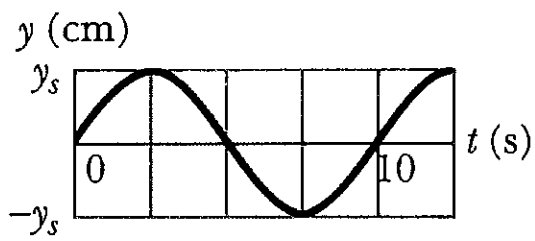

Fig. 1

2. Fig.2 shows a circuit section of four air-filled capacitors that is connected to a larger circuit. The graph below the section shows the electric potential $V(x)$ as a function of position x along the lower part of the section, through capacitor 4. Similarly, the graph above the section shows the electric potential $V(x)$ as a function of position x along the upper part of the section, through capacitors 1, 2, and 3. Capacitor 3 has a capacitance of 0.8 μF. What are the capacitances of (a) capacitor 1 (4%) and (b) capacitor 2 ? (4%)

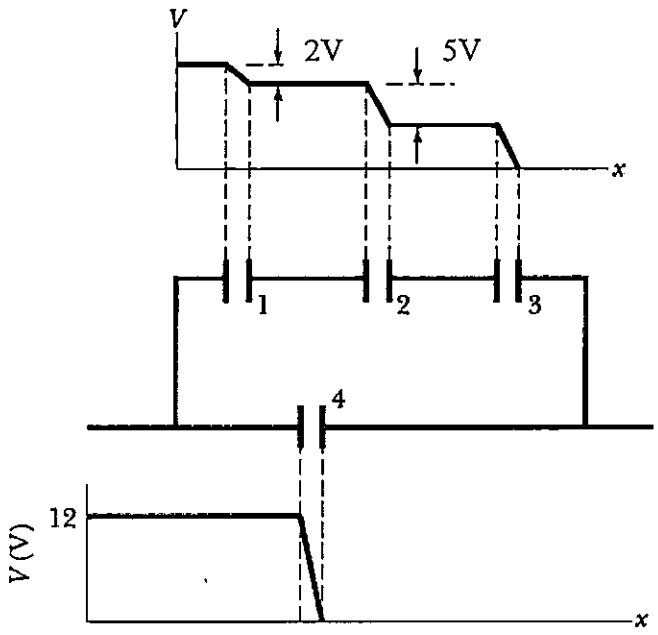

Fig. 2

3. Find the current i in Fig. 3. (5%)

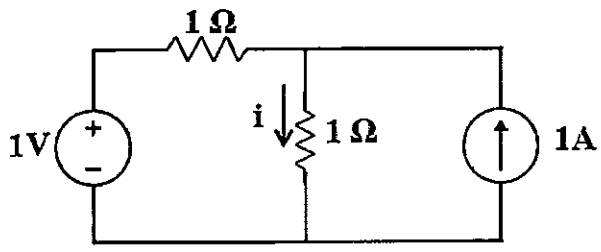

Fig. 3

4. Fine the current *I* in Fig. 4. (5%)

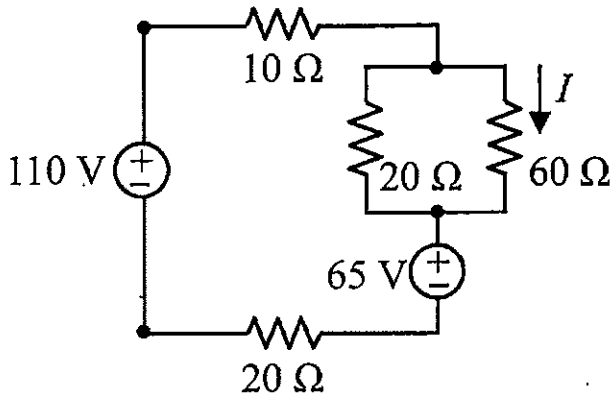

Fig. 4

5. Find the current I_1 in Fig. 5. (5%)

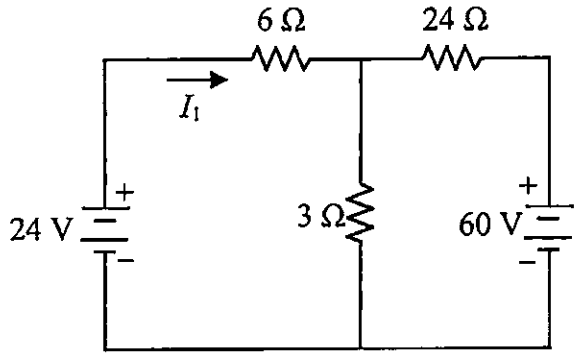

Fig. 5

6. Find the current I_1 and I_2 in Fig. 6. (10%)

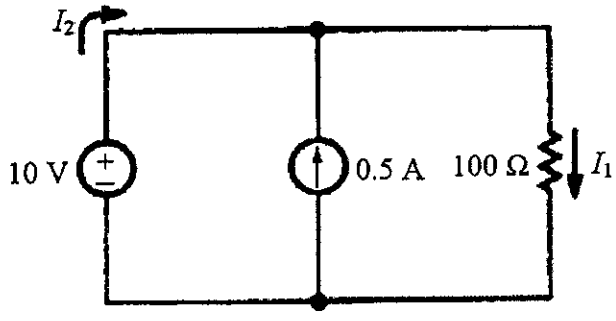

Fig. 6

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7. Find the current I_1 pass through the 8Ω resistor and the short-circuit current I_2 in Fig. 7. (15%, 5% for I_1 and 10% for I_2)

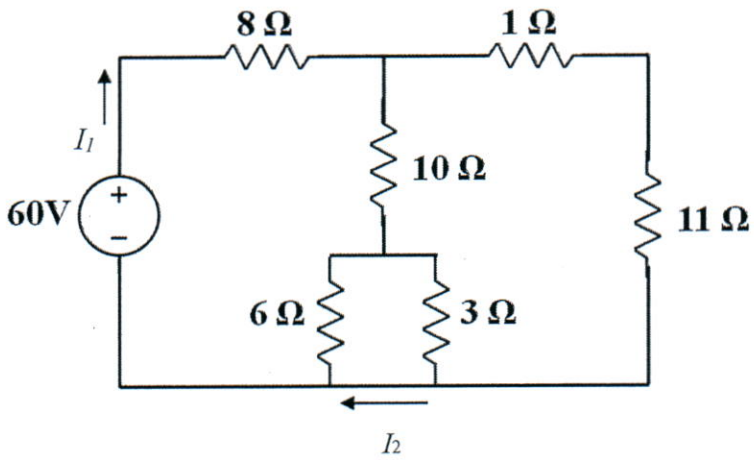

Fig. 7

8. The wire is 10m long with 5A current passing through. The directions of the magnetic fields are shown in Fig. 8a and 8b. Their magnetic flux densities are both $1 Wb/m^2$. Find the two magnetic forces on the current-carrying wires in Fig. 8a and 8b. (10%)

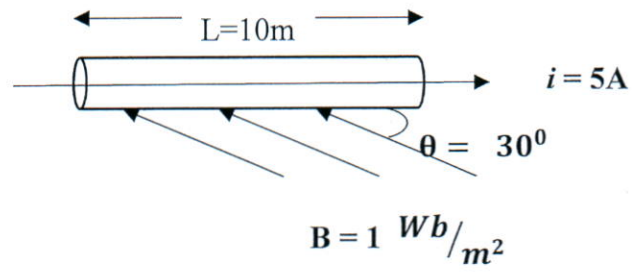

Fig. 8a

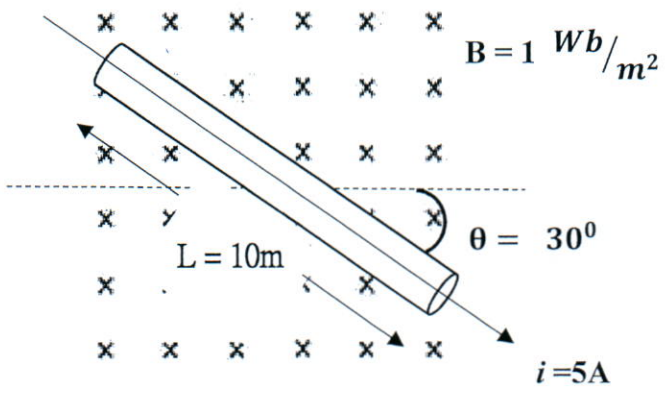

Fig. 8b

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9. In Fig. 9, ε=100V, R1=10Ω, R2=20Ω, R3=30Ω, and L=2H. Immediately after switch S is closed, what are (a) i_1 and (b) i_2 ? A long time later, what are (c) i_1 and (d) i_2 ? The switch S is then reopened. Just then, what are (e) i_1 and (f) i_2 ? A long time later, what are (g) i_1 and (h) i_2 ? (16%)

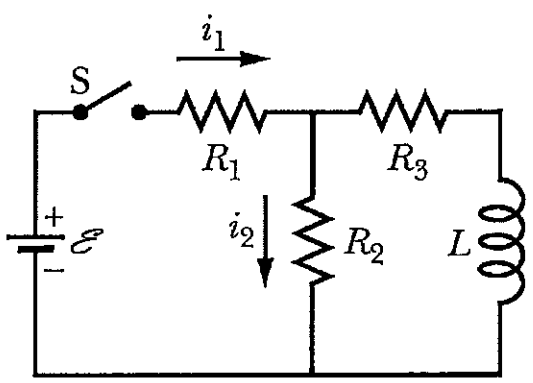

Fig. 9

10. For the magnetic circuit of Fig. 10, the current i flows through the coil of N turns. The mean core length is ℓ_c , and the air gap length is ℓ_g . Assume no magnetic leakage. The flux crossing the cross-sectional area A. The relative permeability of core is μ. The permeability of air is μ_0. Find the flux in the air gap. (10%)

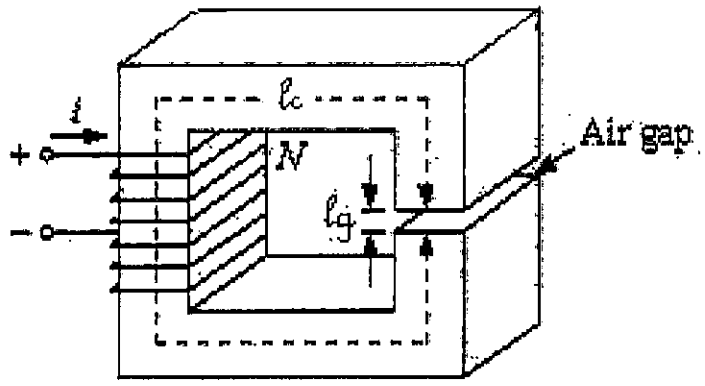

Fig. 10

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