國立臺北科技大學

九十六學年度四年制二、三年級轉學生招生考試

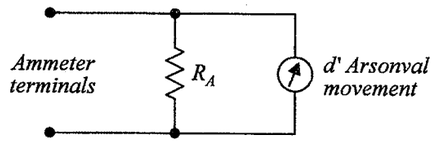
系所組別：四技三年級電機工程系

第三節 專業科目（二）電路學 試題

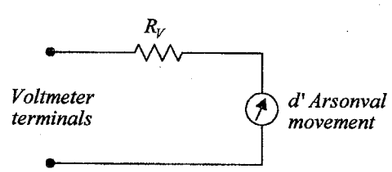
注意事項：

1. 本試題共 5 題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. (a) A 50mV, 1mA d'Arsonval movement is to be used in an ammeter with a full-scale reading of 10mA. Determine R_A. (10%)



(b) A 50mV, 1mA d'Arsonval movement is to be used in a voltmeter with a full-scale reading of 5V. Determine R_V. (10%)



2. (a) If the voltage across the device is

$v(t) = 5 + 10\sin(\omega t + 30°) + 15\sin(2\omega t + 90°) + 20\sin(3\omega t + 180°)$ V,

and the current flowing through the device is

$i(t) = 10 + 20\cos\omega t + 30\cos 2\omega t + 40\cos 3\omega t$ A.

How about the power dissipated in this device? (10%)

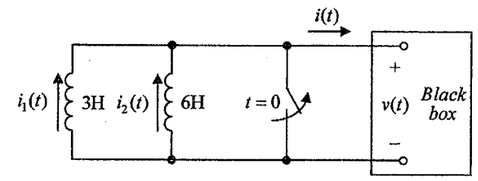
(b) A $\frac{480}{\sqrt{3}}\text{V}_{\text{rms}}$ line feeds two balanced three-phase loads. If two loads are rated:

Load 1: $5\sqrt{5}k$VA at 0.8pf, lagging

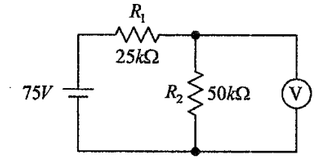
Load 2: $10\sqrt{5}k$VA at 0.6pf, leading

Determine the rms magnitude of the line current from the $\frac{480}{\sqrt{3}}\text{V}_{\text{rms}}$ source. (10%)

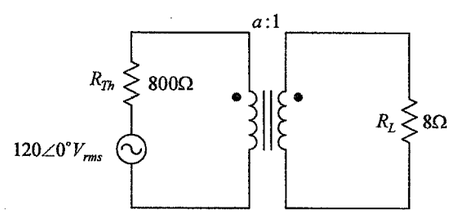
3. The two parallel inductors in the following circuit are connected across the terminals of a black box at $t = 0$. The resulting voltage $v(t)$ for $t > 0$ is known to be $12e^{-t}$V. It is also known that $i_1(0) = 2\text{A}$ and $i_2(0) = 4\text{A}$. How much energy is trapped in the two inductors? (20%)



4. (a) If the 50V scale of a voltage meter with ohm-per-volt rating of 1000Ω is to be used. Use this meter to measure the resistor R_2. How about the reading of this meter? (10%)



(b)Determine the turns ratio of the transformer in the following figure required to ensure the maximum power transferred to the resistive load. (10%)



5. For the linear system as shown in the following, when the input voltage is $v_i(t) = 5\delta(t)\,V$, the output is $v_o(t) = 25e^{-2t} - 15e^{-4t}\,V$. Find the output when the input is $v_i(t) = 4e^{-t}u(t)\,V$. (20%)