1. 在圖 1 中，電阻 R_1, R_2 和 R_3 的電阻值為 330ohm, 500ohm 和 1.2kohm, 直流電源 E 是電池並且電壓為 3.6V。請計算出 V_1, V_2, V_3 和電流 I 的數值。

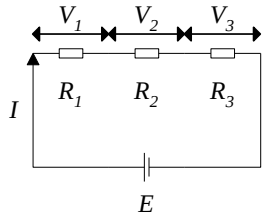
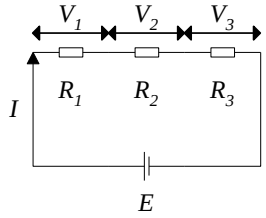


圖 1

In Fig. 1, R_1, R_2 and R_3 are resistors with resistance value 330ohm, 500ohm and 1.2kohm, where the battery is a DC power source with voltage E is 3.6V. Find the value of V_1, V_2, V_3 and I. (16 marks)



2. 參考圖 2，直流電壓 E 串聯電阻 R1 和 R2，橫跨橫電阻 R1 電壓為 V1，橫跨橫電阻 R2 電壓為 V2，寫出 V2 的表達式，即是以 E, R1 和 R2 表達出 V2。

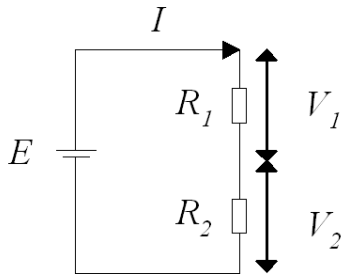


圖.2

In a series resistor circuit, the voltage across each resistor is V1 and V2. Express V2 in terms of E, R1 and R2. (16 marks)

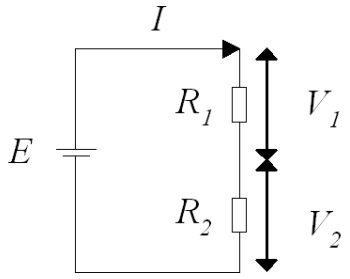


Fig.2

3. 圖 3 之中是餘差電流保護裝置 Residual Current Device (RCD)的電路圖，是以電磁(Electromagnetic)原理的應用，可作家居安全的保護裝置，試描述其原理。

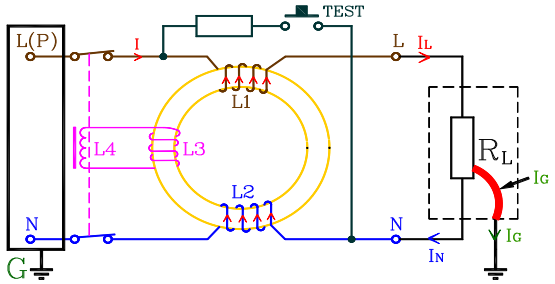


圖 3

In Fig. 3, it shows a circuit diagram of a Residual Current Device (RCD), which is an electromagnetic design application of a protective device. Descript how it operates. (24 marks)

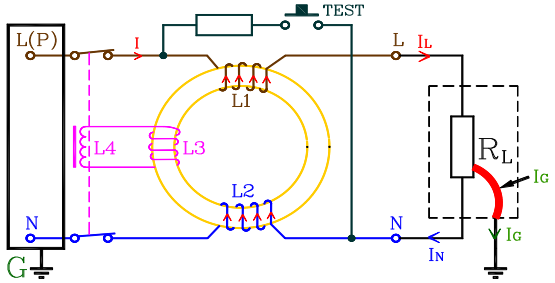


Fig. 3

4.

(a) 在 RLC 串聯電路(Series circuit)中，如果 R= 16 Ω，L = 6 H，C = 2 F，
$v = 5 \sin 4t$ V; 找出 i.

(b) 當 $Z_1 = 2 + j3$ 和 $Z_2 = -2 + j4$, 計算 Z_1Z_2 ?

(c) 兩電流為正弦波(Sine currents):

$$i_1 = 50\sqrt{2}\sin(314t + 30°)A$$ 以及

$$i_2 = 25\sqrt{2}\sin(314t - 60°)A$$

求出以下:

i) 頻率(Frequency), 峰值(Peak value), 有效值(Effective value)和相位差(Phase difference);

ii) 繪出 i_1 和 i_2 的波型;

iii) 描述 i_1 和 i_2 之間的相位關係。

4

(a) In a RLC series circuit , if R= 16 Ω , L = 6 H , C = 2 F ,
v = 5 sin 4t V. To find i. (10 marks)

(b) Calculate the product Z_1Z_2 when $Z_1 = 2 + j3$ and $Z_2 = -2 + j4$.

(10 marks)

(c) Two sine currents:

$i_1 = 50\sqrt{2}\sin(314t + 30°)A$ and

$i_2 = 25\sqrt{2}\sin(314t - 60°)A$

Find:

i) Frequency, peak value, effective value and phase difference. (8 marks)

ii) Draw the waveforms for i_1 and i_2 . (8 marks)

iii) State the phase relationship between i_1 and i_2 . (8 marks)

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