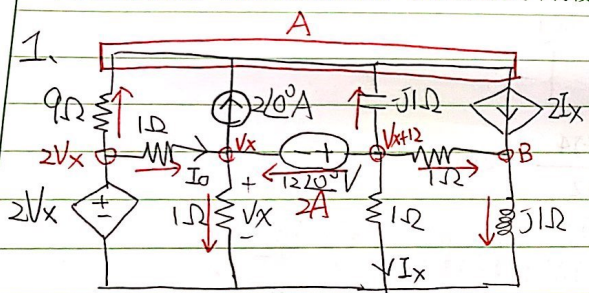


記分欄 從此處開始寫起。試卷用紙務須節用，非經主試認可不得續用其他紙張作答。/Please write from here.



已知  $\frac{V_x}{1} = I_0$ ,  $I_x = \frac{V_{x+12}}{1}$

$$\frac{2V_x - A}{9} + 2 + \frac{V_{x+12} - A}{-j1} = 2I_x \xrightarrow{\text{將 } I_x \text{ 代入}} (-16 + j9)V_x + (-1 - j9)A = 198 - j108 \text{ --- ①}$$

$$\frac{V_{x+12} - B}{1} + 2I_x = \frac{B}{j1} \xrightarrow{\text{將 } I_x \text{ 代入}} 3V_x + (-1 + j1)B = -36 \text{ --- ②}$$

$$2 + \frac{V_{x+12} - A}{-j1} + \frac{V_{x+12}}{1} + \frac{V_{x+12} - B}{1} = 0 \Rightarrow (2 + j1)V_x - j1A - B = -26 - j12 \text{ --- ③}$$

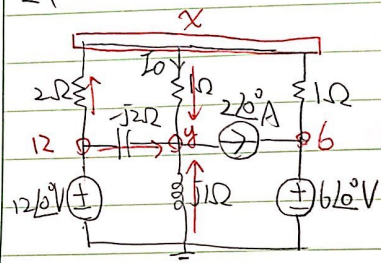
$$\Delta = \begin{vmatrix} (-16 + j9) & (-1 - j9) & 0 \\ 3 & 0 & (-1 + j1) \\ (2 + j1) & (-j1) & (-1) \end{vmatrix} = 34 + j6$$

$$\Delta V_x = \begin{vmatrix} (198 - j108) & (-1 - j9) & 0 \\ -36 & 0 & (-1 + j1) \\ (-26 - j12) & (-j1) & (-1) \end{vmatrix} = -434 - j94$$

$$V_x = \frac{\Delta V_x}{\Delta} = \frac{-434 - j94}{34 + j6} = -12.852 - j0.4966 = 12.86 \angle -177.78^\circ \text{ V}$$

$$I_0 = \frac{V_x}{1} = 12.86 \angle -177.78^\circ \text{ A or } 12.86 \angle 182.22^\circ \text{ A}$$

2.



$$\frac{12-y}{-j2} + \frac{x-y}{1} + \frac{0-y}{j1} = 2 \Rightarrow j2x + (-1-j2)y = 12 + j4 \quad \text{--- ①}$$

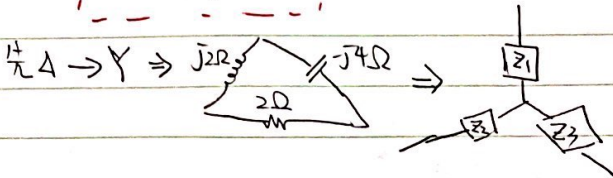
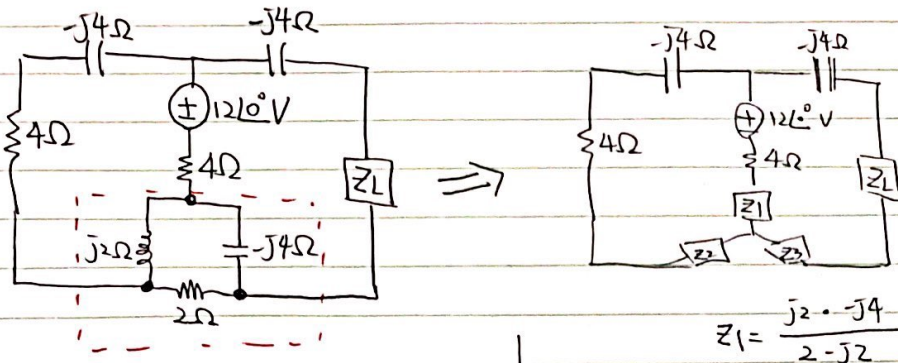
$$\frac{12-x}{2} + \frac{y-x}{1} + \frac{6-x}{1} = 0 \Rightarrow 5x - 2y = 24 \quad \text{--- ②}$$

$$\Delta = \begin{vmatrix} j2 & (-1-j2) \\ 5 & -2 \end{vmatrix} = 5 + j6, \quad \Delta x = \begin{vmatrix} (12+j4) & (-1-j2) \\ 24 & (-2) \end{vmatrix} = j40$$

$$\Delta y = \begin{vmatrix} j2 & 12+j4 \\ 5 & 24 \end{vmatrix} = -60 + j28, \quad x = \frac{\Delta x}{\Delta} = 3.93 + j3.28, \quad y = \frac{\Delta y}{\Delta} = -2.16 + j8.2$$

$$I_0 = \frac{x-y}{1} = 6.09 - j4.92 = 7.83 \angle -38.9^\circ \text{ A}$$

3.

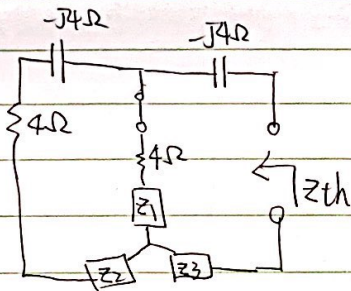


$$Z_1 = \frac{j2 \cdot -j4}{2 - j2} = 2 + j2$$

$$Z_2 = \frac{2 \cdot j2}{2 - j2} = -1 + j1$$

$$Z_3 = \frac{2 \cdot j4}{2 - j2} = 2 - j2$$

Sol: 求  $Z_{th}$

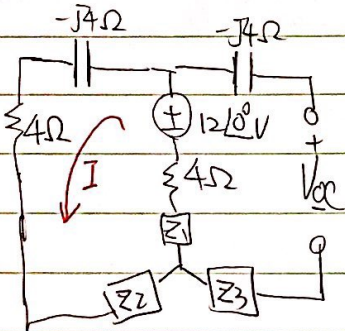


$$Z_{th} = \left\{ \left[ (4 - j4) + Z_2 \right] \parallel (4 + Z_1) \right\} + (-j4) + Z_3$$

$$= 4.7804 - j7.0243$$

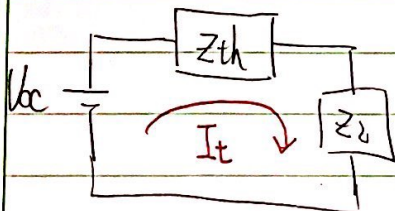
已知  $Z_L$  為電阻性負載，而最大功率轉移之  $Z_L = \sqrt{Z_{th}^2} = 8.5 \Omega$

求  $V_{oc}$



$$12 = (4 - j4 + 4 + 2 + j2 - 1 + j) I, \quad I = 1.31707 + j0.1463$$

$$V_{oc} = 12 - (6 + j2) I = 4.3902 - j3.51219 = 5.122 \angle -38.66^\circ$$

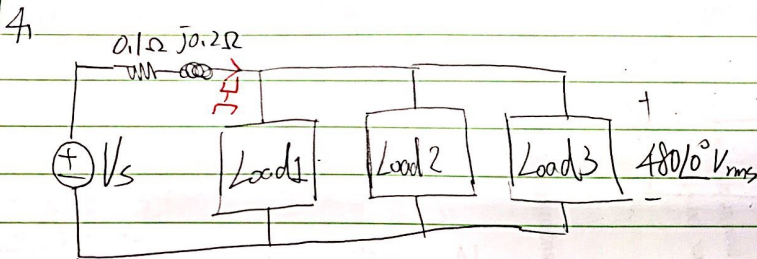


$$P_{max} = \frac{1}{2} \times I_t^2 \times Z_L = 0.595187 \text{ W}$$

$$I_t = \frac{V_{oc}}{(Z_{th} + Z_L)} = 0.367614 - j0.07002$$



記分欄 從此處開始寫起。試卷用紙務須節用，非經主試認可不得續用其他紙張作答。/Please write from here.



Load 1: 30 kW 0.8 leading

$$S_1 = \frac{30 \text{ k}}{0.8} \angle \cos^{-1}(0.8) = 30003 - j22494.8$$

Load 2: 20 kVA 0.9 lagging

$$S_2 = 20 \text{ k} \angle \cos^{-1}(0.9) = 17192.68 + j32.89$$

Load 3: 10 kW 0.8 lagging

$$S_3 = \frac{10 \text{ k}}{0.8} \angle \cos^{-1}(0.8) = 10001 + j7498.2$$

$$S_T = S_1 + S_2 + S_3 = 57996 - j6263.71$$

$$= 58333.267 \angle -6.164^\circ$$

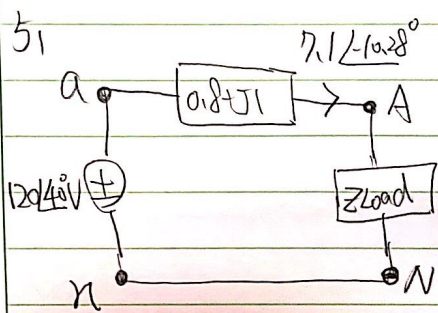
$$I = \left( \frac{S_T}{480 \angle 0^\circ} \right)^* = 121.527 \angle 6.164^\circ \text{ A}_{rms}$$

$$V_s = (0.1 + j0.2) \times I + 480 \angle 0^\circ = 490.134 \angle 2.91^\circ \text{ V}_{rms}$$

$$V_s(t) = 693.154 \cos(377t + 2.91^\circ)$$

$$S_{source} = I^* \times V_s = 59564.62 \angle -3.18^\circ = 59472.89 - j3304.22$$

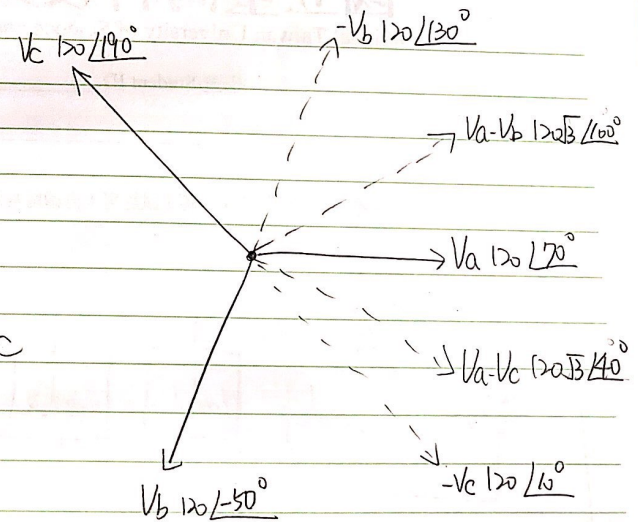
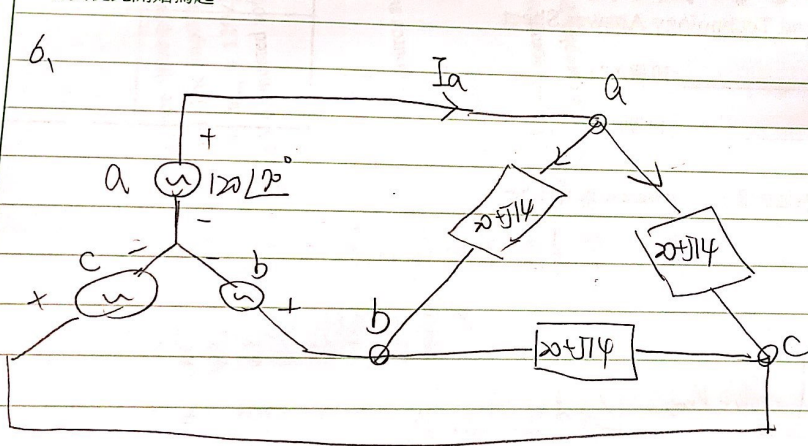
$$PF = \cos(-3.18^\circ) = 0.9984 \text{ leading}$$



$$Z_{Load} = \frac{120 \angle 40^\circ}{7.1 \angle -10.28^\circ} - (0.8 + j1) = (10 + j12) \Omega = 15.62 \angle 50.2^\circ \Omega$$

記分欄

轉頁從此開始寫起。



$$V_{ab} = V_a - V_b = 120\sqrt{3} \angle 100^\circ$$

$$V_{ac} = V_a - V_c = 120\sqrt{3} \angle 40^\circ$$

$$I_a = \frac{V_{ab}}{20 + j14} + \frac{V_{ac}}{20 + j14} = (12.08 + j8.46) A = 14.75 \angle 35^\circ A$$

7

$$\text{Load 1, } S_1 = 30k \angle \cos^{-1}(0.8) = 23990 + j18012.6$$

$$\text{Load 2, } S_2 = \frac{24k}{0.6} \angle \cos^{-1}(0.6) = 24016.8 - j31987$$

$$S_{\text{source}} = S_1 + S_2 + S_3 = 120 \angle 0^\circ \text{ kVA} = 120000 + j0$$

$$S_3 = 71992.6 + j13975 = \underline{73336 \angle 0.9^\circ} \quad \text{pf} = \cos(0.9^\circ) = \underline{0.98 \text{ lagging}}$$