

國立高雄大學 101 學年度轉學招生考試試題(轉三年級)

科目：電路學
 考試時間：80 分鐘

系所：電機工程學系 (無組別)
 本科原始成績：100 分

是否使用計算機：是

1. Consider the network shown in **Fig. P1**. Find
- (5%) v_x ;
 - (5%) i_{in} ;
 - (5%) I_S ;
 - (5%) the power provided by the dependent source.

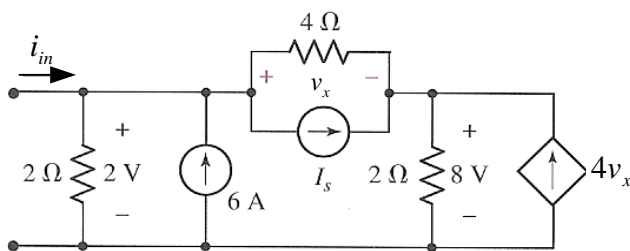


Fig. P1

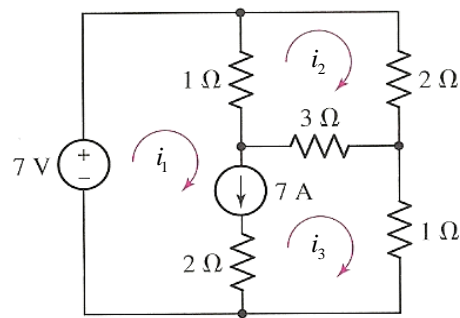


Fig. P2

2. (15%) For the circuit shown in **Fig. P2**, use the technique of mesh analysis to write the mesh current equations. (You **do not** have to evaluate the three mesh currents.)
3. The switch in the circuit shown in **Fig. P3** has been closed for a very long time. The switch opens at $t = 0$. Find i_R at
- (5%) $t = 0^-$;
 - (5%) $t = 0^+$;
 - (5%) $t \rightarrow \infty$;

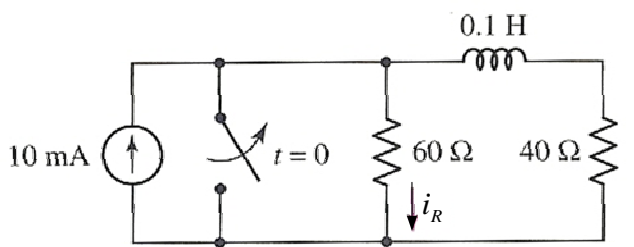


Fig. P3

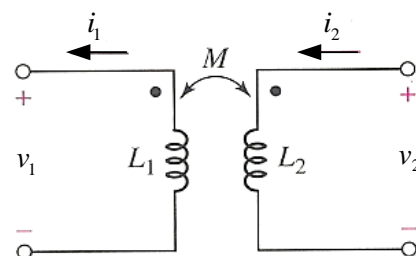


Fig. P4

4. In **Fig. P4**, assume that $v_1 = 2e^{-t}$ V and $v_2 = 4e^{-t}$ V. If $L_1 = L_2 = 2$ mH and $M = 1$ mH, determine
- (5%) di_1/dt ;
 - (5%) di_2/dt ;
 - (5%) $i_2(t)$ if there is no energy stored at $t = 0$.

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5. Consider the network shown in **Fig. P5**.
- (5%) Use **source transformation** to find the voltage v_o .
 - (5%) Find the power developed from the 250-V voltage source.
 - (5%) Find the power developed from the 8-A current source.

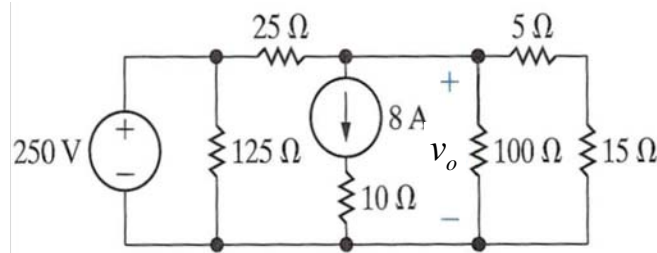


Fig. P5

6. (10%) Find the Thévenin equivalent with respect to the terminals a, b for the circuit in **Fig. P6**.

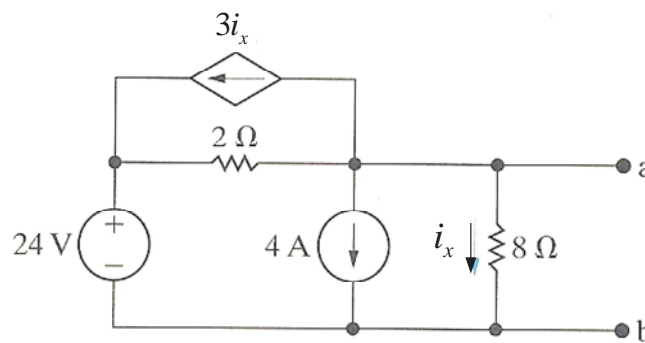


Fig. P6

7. Consider the circuit shown in **Fig. P7**. Find

- (5%) the current i_o ;
- (5%) the voltage v_o .

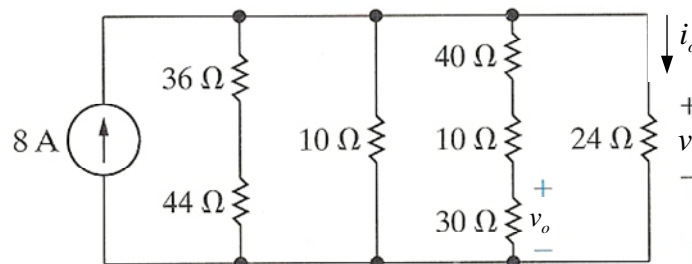


Fig. P7

國立高雄大學 101 學年度轉學招生考試試題(轉三年級)

科目：工程數學
考試時間：80 分鐘

系所：
電機工程學系(無組別)
本科原始成績：100 分

是否使用計算機：是

請按題號順序作答，跳號者以零分計。推導完成處，要以“#”表示，違者扣 5 分。

Q1. (10%) Compute the inverse matrices of the following matrices:

$$(a) \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 4 & 5 & 3 \end{bmatrix} \quad (b) \begin{bmatrix} 1 & 2 & -1 \\ 2 & 4 & -3 \\ 1 & -2 & 0 \end{bmatrix}$$

Q2. (15%) Consider the linear transformation $T: R^3 \rightarrow R^2$ defined by

$T(x, y, z) = (x - y, x + z)$. (a) Find the matrix of T with respect to the bases $\{u_1, u_2, u_3\}$ and $\{u_1', u_2'\}$ of R^3 and R^2 , where $u_1 = \{1, -1, 0\}$, $u_2 = \{2, 0, 1\}$, $u_3 = \{1, 2, 1\}$, and $u_1' = \{-1, 0\}$, $u_2' = \{0, 1\}$. (b) Using the matrix to find the image of the vector $u = \{3, -4, 0\}$

Q3. (15%) For the matrix $A = \begin{bmatrix} -4 & -6 \\ 3 & 5 \end{bmatrix}$,

- (a) Show that matrix A is diagonalizable.
- (b) Find a diagonal matrix D that is similar to A .
- (c) Compute A^9

Q4. (15%) $X' = \begin{pmatrix} 6 & 1 \\ 4 & 3 \end{pmatrix} X + \begin{pmatrix} 6t \\ -10t + 4 \end{pmatrix}$ on $(-\infty, \infty)$, solve X

Q5. (15%) Solve $y'' - 6y' + 9y = 6x^2 + 2 - 12e^{3x}$

Q6. (15%) Find the **series solutions** for the differential equation $2xy'' + (1+x)y' + y = 0$, write down at least **four non-zero coefficients** for **each** independent solution.

Q7. (15%) Solve $y'' + 4y' + 5y = \delta(t - 2\pi)$, $y(0) = 0$, $y'(0) = 0$.