

國立高雄大學 102 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

Q1:(10%) Solve $\int \frac{x^2 - 2x + 2}{x^2 - 4x + 3} dx$

Q2:(15%) Let $\mathbf{u}=(x_1, x_2)$ and $\mathbf{v}=(y_1, y_2)$ be elements of \mathbf{R}^2 . Prove that the function $\langle \mathbf{u}, \mathbf{v} \rangle = 3x_1y_1 + 9x_2y_2$ defines an inner production on \mathbf{R}^2 .

Q3:(15%) Evaluate $\int_{AB} xdx + 2ydy + 3(x + y - z)dz$, where the path of integration AB is the straight line from point A(1,2,3) to point B(6,5,4).

Q4:(15%) Solve $y'' + 3y' + 2y = \delta(t - 1) + e^{-t}$, $y(0) = y'(0) = 0$

Q5:(15%) Solve $x^2 y'' + 10xy' + 8y = x^2$

Q6:(15%) Determine the Fourier series for the following periodic function

$$f(x) = \begin{cases} -2, & -2 \leq x < 0 \\ 0, & 0 \leq x < 2 \end{cases}, f(x+4) = f(x)$$

Q7:(15%) Solve $X' = \begin{pmatrix} -5 & 6 \\ 0 & -7 \end{pmatrix} X + \begin{pmatrix} 1 \\ t \end{pmatrix}$

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1. Show how to combine four 100- Ω resistors to obtain an equivalent resistance of

- (a) (5%) 25 Ω ;
- (b) (5%) 60 Ω ;
- (c) (5%) 40 Ω .

2. With reference to the circuit shown in **Fig. P2**:

- (a) (5%) let $v_x = 10$ V and find I_S ;
- (b) (5%) let $I_S = 50$ A and find v_x ;
- (c) (5%) calculate the ratio v_x / I_S .

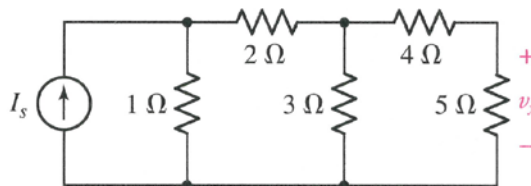


Fig. P2

3. (10%) For the circuit shown in **Fig. P3**, determine the current labeled i .

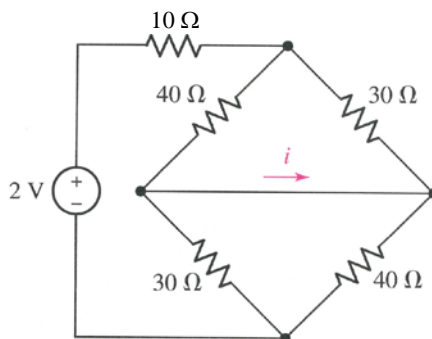


Fig. P3

4. (10%) Use the principle of **superposition** on the circuit shown in **Fig. P4** to find the voltage v .

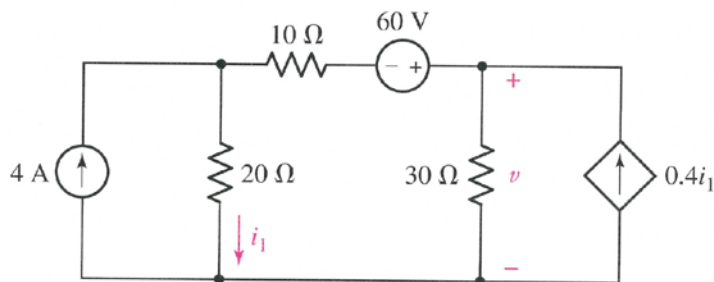


Fig. P4

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是否使用計算機：是

5. Consider the network shown in **Fig. P5**.

- (a) (10%) Use **source transformation** to reduce the circuit to a practical voltage source in series with the $10\text{-}\Omega$ resistor.
 (b) (5%) Calculate v .
 (c) (5%) Explain why the $10\text{-}\Omega$ resistor should not be included in a source transformation.

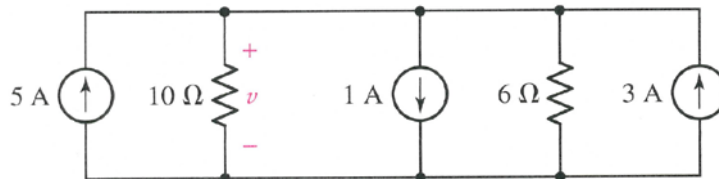


Fig. P5

6. Consider the network shown in **Fig. P6**.

- (a) (10%) Find the Thevenin equivalent seen by the resistor R_L .
 (b) (5%) If any value whatsoever may be selected for R_L , what is the maximum power that could be dissipated in R_L .

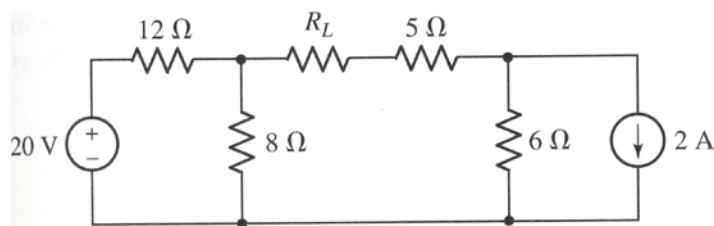


Fig. P6

7. (15%) Consider the circuit of **Fig. P7**. Compute the three mesh currents indicated.

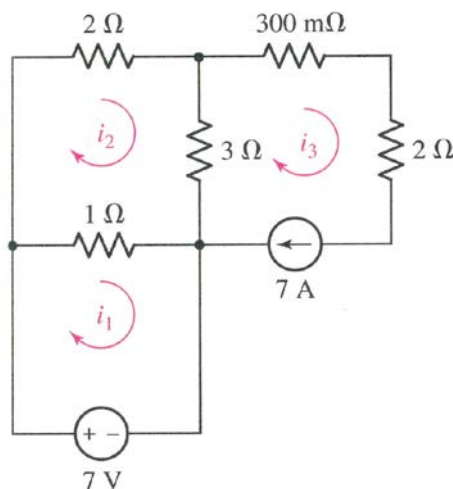


Fig. P7