國立雲林科技大學 113 學年度 碩士班招生考試試題

系所：電機系

科目：電路學

1. In the circuit of **Fig. 1**, find the values of V_{ab} and V_{cd}. (10%). (10%)

2. In the circuit of **Fig. 2**, find the value of V_o using the mesh current method. (20%)

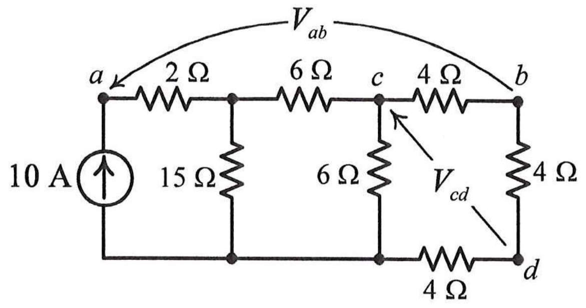

Fig. 1

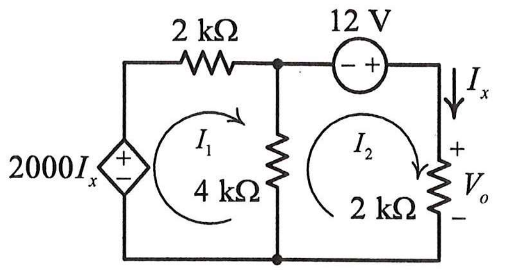

Fig. 2

3. Referring to **Fig. 3**, the switch closes at t=0, and the initial conditions are $i(0)$=0 and $v(0)$=0.
   (a) Calculate the final conditions $v(\infty)$ and $i(\infty)$. (6%)
   (b) Find the circuit's natural frequencies s_1 and s_2. (6%)
   (c) Calculate the capacitor's voltage $v(t)$ for $t > 0$. (8%)

4. Find the current **I** in the circuit in **Fig. 4**. (16%)

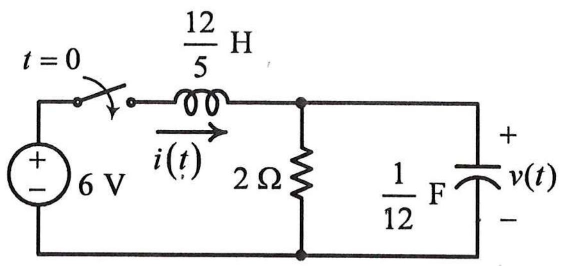

Fig. 3

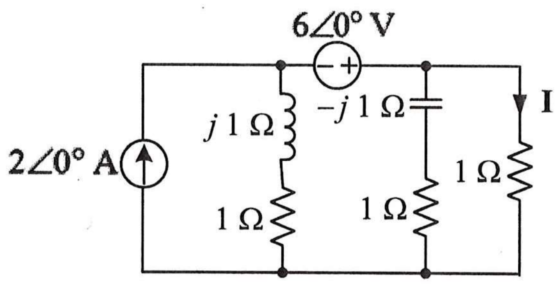

Fig. 4

5. Find the current $\mathbf{I}_1$ and the output voltage $\mathbf{V}_o$ in the circuit in **Fig. 5**. (16%)

6. In the balanced three-phase system shown in **Fig. 6**, the line voltage is 34.5 kV rms at 60 Hz. Find the values of the capacitors C such that the total load has a power factor of 0.90 lagging. (18%)

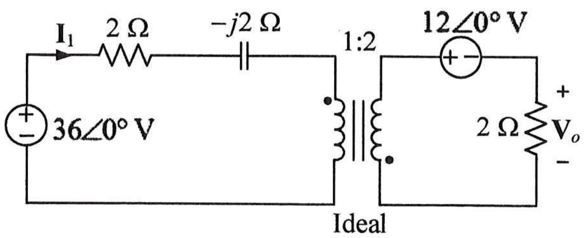

Fig. 5

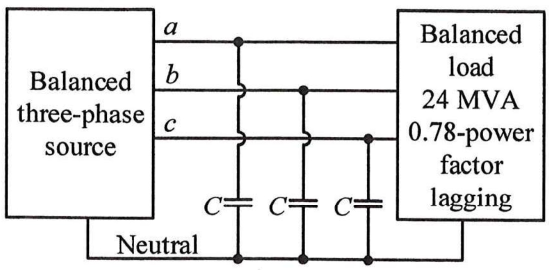

Fig. 6

國立雲林科技大學 113 學年度
碩士班招生考試試題

系所：電機系
科目：工程數學(1)

1. (15%) Solve the general solution of the following differential equations:

   (1) $\frac{dy}{dx} = e^{2x-3y}$ (5%)

   (2) $x\frac{dy}{dx} - y = x^2\sin x$ (5%)

   (3) $y^3dx + 3xy^2dy = 0$ (5%)

2. (10%) Solve the initial value problem: $5y'' + y' = -6x,\ y(0) = 0, y'(0) = -10$

3. (15%) Find the given Laplace transform or inverse transform:

   (1) $\mathcal{L}\{e^t(\cos\omega t - 2\sin\omega t)\}$ (5%)

   (2) $\mathcal{L}^{-1}\{\frac{3}{s(s^2+9)}\}$ (5%)

   (3) $\mathcal{L}\{\int_0^t \tau\, e^{t-\tau}d\tau\}$ (5%)

4. (10%) Find the Fourier series of $f(t) = \pi + t$ on the interval $-\pi < t < \pi$.

5. (10%) Find parameter equation of line L through the point $P_0(2, 3, -4)$ and $P_1(3, -2, 5)$.

6. (20%) Let V be R^3 and let S=$\{\mathbf{v}_1, \mathbf{v}_2, \mathbf{v}_3\}$ and T=$\{\mathbf{w}_1, \mathbf{w}_2, \mathbf{w}_3\}$be ordered bases for R^3.

   $\mathbf{v}_1 = [2\quad 0\quad 1]^T$, $\mathbf{v}_2 = [1\quad 2\quad 0]^T$, $\mathbf{v}_3 = [1\quad 1\quad 1]^T$,

   $\mathbf{w}_1 = [6\quad 3\quad 3]^T$, $\mathbf{w}_2 = [4\quad -1\quad 3]^T$, $\mathbf{w}_3 = [5\quad 5\quad 2]^T$,

   (1) Compute the transition matrix $\boldsymbol{P}_{S\leftarrow T}$ from the T-basis to the S-basis. (10%)

   (2) This is the vector $\mathbf{v} = [4\quad -9\quad 5]^T$. Express the $\mathbf{v}$ in terms of S-basis and T-basis. (10%)

7. (20%) Let the matrix A is a symmetric matrix.

   $$A = \begin{bmatrix} 0 & 2 & 2 \\ 2 & 0 & 2 \\ 2 & 2 & 0 \end{bmatrix}$$

   Find the orthogonal matrix $\boldsymbol{P}$ such that $\boldsymbol{P}^{-1}\boldsymbol{A}\boldsymbol{P} = \boldsymbol{P}^T\boldsymbol{A}\boldsymbol{P} = \boldsymbol{D}$. $\boldsymbol{D}$ is a diagonal matrix. The eigenvalues of $\boldsymbol{A}$ lie on the main diagonal of $\boldsymbol{D}$.