

# 國立中央大學九十一年度轉學生入學試題卷

物理學系 三年級

科目：應用數學

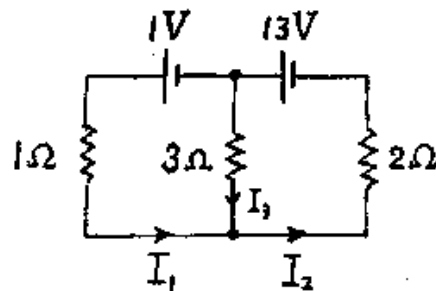
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(每題 20 分，滿分 100 分)

1. Solve the following initial value problems for  $y(x)$ :  $\begin{cases} y'' - 4y' + 3y = 10 \sin(x), \\ y(0) = 2, \quad y'(0) = 1. \end{cases}$  (20%)

2. Find the currents in the following network by:

- (i) Cramer's rule, (10%)  
 (ii) Gauss elimination. (10%)



3. Given three points  $(0, 1, 1)$ ,  $(5, 0, -5)$  and  $(3, 2, 0)$  in space,  
 (i) determine the area of the triangle with these three points as the vertices, (10%)  
 (ii) find an equation of the plane through these three points. (10%)

4. Given a vector function:  $\vec{F}(\vec{r}) = [x, 2y, 3z]$ , where  $\vec{r} = [x, y, z]$   
 (i) evaluate the line integral  $\int_C \vec{F}(\vec{r}) \cdot d\vec{r}$ , where  $C$ : the circle  $x^2 + y^2 = 4, z = 0$ . (10%)  
 (ii) evaluate the surface integral  $\int_S \vec{F}(\vec{r}) \cdot \hat{n} dA$ , where  $S$ : the surface of the cylinder  $x^2 + y^2 \leq 4, 0 \leq z \leq 2$ . (10%)

5. Find the Taylor series of the complex function:  $f(z) = 1/(z + 4i)$  with the center:  $z_0 = 3$ . (10%)  
 Also, determine its radius of convergence. (10%)

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