

科目：工程數學 適用：土木系三

編號：811

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

本 試 題

共 1 頁

第 1 頁

1. (20%) Solve the differential equation $y'' + x^2 y = 0$ using the power series approach.

2. (20%) Solve the 2nd-order ODE $y'' + 4y' + 3y = e^t$ using the Laplace transform approach. The initial conditions are $y(0) = 0$ $y'(0) = 2$.

3. (15%) Find the eigenvalues and eigenvectors of the following matrix:

$$\begin{bmatrix} 4 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

4. (20%) Solve the linear system of equations:

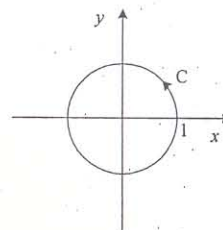
$$x_1 + 2x_2 - x_3 + 2x_4 = 3$$

$$x_1 - 2x_2 - 3x_3 + x_4 = -1$$

$$-2x_1 + x_2 - x_3 + 2x_4 = 3$$

$$-x_1 - 3x_2 + 2x_3 + 2x_4 = 2$$

5. (15%) $\vec{F} = y\vec{i} + x\vec{j}$, calculate the line integral $\int_C \vec{F}(\vec{r}) \cdot d\vec{r}$ for the integral path: a circle of radius 1, see the figure below:



6. (10%) If $\begin{vmatrix} a & b & c & d \\ e & f & g & h \\ c & d & e & f \\ g & h & a & b \end{vmatrix} = u$, find the value of

$$\begin{vmatrix} a & b & c & d \\ e & f & g & h \\ pa+c & pb+d & pc+e & pd+f \\ qg & qh & qa & qb \end{vmatrix}$$