

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。

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第 2 頁

1. For the differential equation

$$y'' + y''' - y' - y = 2e^x - 3e^{-x} - \cos 2x + 3x$$

(1) find the homogeneous solution $y_h(x)$. (10%)

(2) for the particular solution $y_p(x)$, how do you assume the form of $y_p(x)$. (10%) (Don't solve $y_p(x)$, or you will waste a lot of time.)

2. (20%) Solve the 2nd-order ODE $y'' + 2y' + 2y = 0$ using the Laplace transform approach. The initial conditions are $y(0) = 1$

$$y'(0) = -3$$

3. (20%) One of the eigenvalues of the following matrix is 3. Find the other two eigenvalues and the three eigenvectors corresponding to the three eigenvalues:

$$\begin{bmatrix} 6 & 2 & -2 \\ 2 & 5 & 0 \\ -2 & 0 & 7 \end{bmatrix}$$

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

$$\begin{aligned} w + 2x - 3y - z &= 1 \\ 2w + x + y + z &= 4 \\ -w - x - 2y + z &= 4 \\ w + 3x + y - 2z &= -6 \end{aligned}$$

5. (20%) A particle moves along a path $\vec{r} = x^2$ from A(0,0) to

B(2,4). During the motion, the particle is subjected to a force

$\vec{F} = y^3 \vec{i} + x^3 \vec{j}$. Calculate the work done on the particle by the force.