國立暨南國際大學 108 學年度轉學生入學考試試題　第 1 節

科目：工程數學　　適用：土木系三

編號：721

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
共壹頁
第壹頁

1. Solve the following ordinary differential equations:
   (1) $y'' - y = e^{2x}$. (10%)
   (2) $y'' - y = e^{x}$. (10%)

2. (20%) Solve the linear system of equations using the Gauss elimination:
$$x_1 + 2x_2 - x_3 + 2x_4 = 3$$
$$x_1 - 2x_2 - 3x_3 + x_4 = -1$$
$$2x_1 + x_2 - x_3 + 2x_4 = 3$$
$$-x_1 - 3x_2 + 2x_3 + 2x_4 = 2$$

3. (20%) Find the eigenvalues and eigenvectors of the following matrix ($i = \sqrt{-1}$):
$$\begin{bmatrix} 0 & i & 0 \\ i & 0 & i \\ 0 & 0 & 0 \end{bmatrix}$$

4. Scalar function $f = f(x,y,z) = 2x^2 + 3y^2 - z^2$,
   (1) calculate $\nabla f$. (6%)
   (2) calculate $\nabla \cdot \nabla f$. (7%)
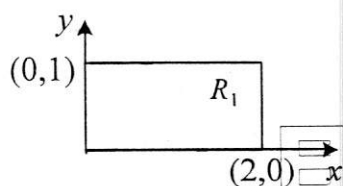   (3) calculate $\nabla \times \nabla f$. (7%)

5. Calculate $\iint_R x y^2 \, dx \, dy$, where $R$ is the region defined as
   (1) a rectangle with side lengths of 2 and 1, see $R_1$ as shown in Figure 1. (10%)
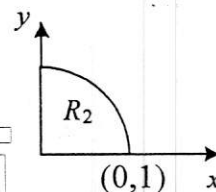   (2) a quarter circle with a radius of 1, see $R_2$ as shown in Figure 2. (10%)



Figure 1

Figure 2