國立嘉義大學 101 學年度

資訊工程學系碩士班（乙組）招生考試試題

科目：工程數學

(注意事項：1.不可使用計算機。 2.依次序作答。 3.試題隨試卷繳回。)

1. Solve the differential equation $(y^2+xy^3)dx+(5y^2-xy+y^3\sin y)dy=0$.(10%)

2. Solve $x^2y''-4xy'+6y=7\ln(x^2)$.(12%)

3. Evaluate the following problems:

   (a) the Laplace transform of $f(t)=e^{-5t}(t^4+2t^2+t)$; (7%)

   (b) the Laplace transform of $\int_0^t e^{\tau}(t-\tau)d\tau$.(7%)

4. Solve $y''+9y=r(t),$ where $r(t)=8\sin t[u(t)-u(t-\pi)]$; $y(0)=0$, $y'(0)=4$. (12%)

5. Solve Laplace's equation $\nabla^2 u=0$ for a rectangular plate subject to the given boundary conditions $\begin{cases} u(0,y)=0 & u(2,y)=100 \\ u(x,0)=0 & u(x,1)=200\sin 4\pi x \end{cases}$.(12%)

6. Evaluate $\oint_C \frac{z^2+1}{(z-1)^2(z+2i)}dz$, where the contour C is the circle $|z+i|=7$.(10%)

7. Give two matrices $[A]=\begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 4 \\ 1 & -1 & 1 \end{bmatrix}$; $[B]=\begin{bmatrix} 5 & -1 & 0 \\ 0 & -5 & 9 \\ 5 & -1 & 0 \end{bmatrix}$.

   (a) Find the inverse of [A] . (8%)
   (b) Find all the eigenvalues and their corresponding eigenvectors of [B]. (10%)

8. Consider the data (2, 1), (3, 2), (4, 3), (5, 2) on the 2D plane. Find the least squares line for the given data. (12%)