國立嘉義大學九十六學年度

土木與水資源工程學系碩士班招生考試試題

科目：工程數學

（如條件不足，請自行假設。）

1. The wave equation $\dfrac{\partial^2 u}{\partial t^2} = c^2 \dfrac{\partial^2 u}{\partial x^2}$, $u(0,t)=0$, $u(l,t)=0$, $u(x,0)=\sin\dfrac{\pi x}{l}$, $u_t(x,0)=0$.

   Solve the PDE by the method of separating variables. (20%)

2. Evaluate the following integral by residue integration method. (20%)

$$\int_0^\infty \frac{\cos 2x}{x^2+4}\,dx = ?$$

3. Matrix A=$\begin{bmatrix} 3 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 3 \end{bmatrix}$, determine its Eigen values and Eigen vectors. (20%)

4. Derive Tylor series at a. (20%)

$$f(x) = f(a) + \frac{f'(a)}{1!}(x-a)^1 + \frac{f''(a)}{2!}(x-a)^2 + \frac{f'''(a)}{3!}(x-a)^3 + \ldots\ldots + \frac{f^{(n)}(a)}{n!}(x-a)^n + \ldots\ldots$$

5. $\vec{F} = x\vec{i} + y\vec{j} + z^2\vec{k}$, $\displaystyle\iint_s (\vec{F}\cdot\vec{n})\,ds = ?$ (20%)

   Where s is the surface of the cylinder $x^2 + y^2 = 4$, $0 \le z \le 3$.

   Find the values by direct surface integration.