編號： 103

國立成功大學 108 學年度碩士班招生考試試題

系　　所：土木工程學系

考試科目：工程數學

考試日期：0223，節次：3

※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Use the Laplace transform to solve the initial-value problem,

$y'' + y = 3\sin 2t$ with $y(0) = 1$ and $y'(0) = 1$. (20%)

2. Use the Laplace transform and the results of Problem 1 to solve the boundary-value problem,

$y'' + y = 3\sin 2t$ with $y(0) = 1$ and $y(\pi/2) = 1$. (10%)

3. Use the power series method to solve the initial-value problem,

$y'' - 2xy' + 8y = 0$ with $y(0) = 3$ and $y'(0) = 0$. (25%)

4. Verify Green's theorem by evaluating both integrals in $\oint_C (-y^2)\,dx + x^2\,dy = \iint_R (2x + 2y)\,dA$,

where C is the circle $x^2 + y^2 = 9$. (20%)

5. Solve the partial differential equation, $a^2 \dfrac{\partial^2 u}{\partial x^2} = \dfrac{\partial^2 u}{\partial t^2}$, $0 \le x \le 1$, $t > 0$, where a is a constant,

subject to the given conditions: $\begin{cases} u(0,t) = 0,\ u(1,t) = 0,\ t > 0 \\ u(x,0) = x(1-x),\ \left.\dfrac{\partial u}{\partial t}\right|_{t=0} = x(1-x),\ 0 \le x \le 1 \end{cases}$. (25%)