編號： 108

國立成功大學 107 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：0205，節次：3

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

1. Solve the following ordinary differential equations.

(a) $3(1+x^2)y'+2xy=2xy^4$. (15%)

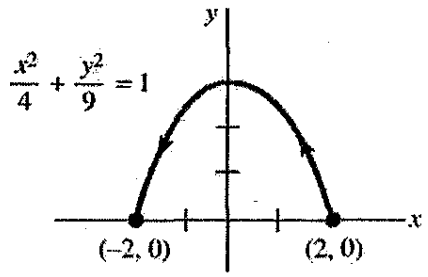
(b) $y''-2y'+y=\dfrac{e^x}{(1-x)^2}$. (15%)

2. Solve the integral equation: $f(t)=te^t+\int_0^t \tau f(t-\tau)d\tau$ (15%)

3. Find two power series solutions of the following equation about the point $x=0$.

$xy''-xy'+y=0$ (20%)

4. Find the work done by the force $\mathbf{F}(x,y)=(2x+e^{-y})\mathbf{i}+(4y-xe^{-y})\mathbf{j}$ along the indicated curve.



(15%)

5. (a) Find the eigenvalues and eigenfunctions of the boundary-value problem:

$x^2y''+xy'+\lambda y=0,\ y(1)=0,\ y(5)=0$. (10%)

(b) Put the differential equation in self-adjoint form $[r(x)y']'+[q(x)+\lambda p(x)]y=0$, find the functions $r(x), q(x)$, and $p(x)$. (5%)

(c) Give an orthogonality relation. (5%)