淡江大學九十二學年度碩士班招生考試試題

系別：機械與機電工程學系　　　　科目：工　程　數　學

准攜項目請打「○」否則打「×」
簡單型計算機

本試題共壹頁

1. Find the solution of (a) $x^2 y'' + xy' - y = 0$
(20%)
(b) $x^2 y'' + xy' - y = x$

2. For a nonsingular matrix $\underline{A}$, $|\underline{A}| \neq 0$, show that the eigenvalues of
(15%) the inverse of the transpose of $\underline{A}$ are the same as that of the transpose of the inverse of $\underline{A}$.

3. Give the general solutions of the Bessel equation
(10%) $x^2 y'' + xy' + (x^2 - \nu^2) y = 0$
for $\nu = 0$, $\nu = 0.1$. (不用推導，請直接給答)

4. What boundary conditions must be satisfied for the
(15%) Sturm-Liouville equation $[r(x) y']' + [q(x) + \lambda p(x)] y = 0$, $a \leq x \leq b$, where λ is a constant parameter as eigenvalues of the system, so that the eigenfunctions of the system would satisfy orthogonal set of functions. (直接給答，不用推導).

5. For the PDE $\dfrac{\partial^2 u}{\partial t^2} = c^2 \dfrac{\partial^2 u}{\partial x^2}$
(20%) Show that $u(x,t) = g(x + ct) + f(x - ct)$

6. $z = x + iy$, Show that $\displaystyle\int_c \dfrac{dz}{z^m} = 2\pi i$, if $m = 1$
(20%)
$\displaystyle\int_c \dfrac{dz}{z^m} = 0$, if $m \neq 1$, m = integer
c: closed path with $z = 0$ inside C