科目名稱	工程數學	類組代碼	D36
		科目碼	D3691

※本項考試依簡章規定所有考科均「不可」使用計算機。　　本科試題共計　1　頁

1. (25%)

(1) (10%) Given the equation $(mx+ny)dx+(kx+ly)dy=0$, where m, n, k, and l are constants. Find the condition that the equation is exact and solve the exact equation.

(2) (15%) Solve the equation $my''+ny'+ky=le^x$, where m, n, k, and l are constants, and $n^2=4mk$, $l=m+n+k$, and $-n/(2m) \neq 1$.

2. (25%)

Given the matrix $\mathbf{A} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{bmatrix}$.

(1) (10%) Determine the inverse of $\mathbf{A}$.

(2) (15%) Determine the eigenvalues of $\mathbf{A}$.

3. (25%)

Given $f = x/y$. Find

(1) (10%) $(\text{grad } f)\cdot(\text{grad } f)$

(2) (15%) $\nabla^2(f^2)$

4. (25%)

(1) (10%) Given $f(t)=k$, $a<t<b$ and $k>0$. Find the Laplace transform of $f(t)$.

(2) (15%) Given $f(t)=t/k$, $0<t<k$ and $k>0$. Find the Laplace transform of $f(t)$.