淡江大學九十學年度碩士班招生考試試題

系別：土木工程學系　　科目：工 程 數 學

准帶項目請打「○」否則打「x」	
計算機	字典
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本試題共 2 頁

本試題雙面印製

1. Solve the given differential equations. (30%)

(1) $xy' - 4y = x^6 e^x$

(2) $y'' + y' - 6y = 2x$

(3) $9yy' + 4x = 0$

(4) $x^2y'' + 3xy' - 4y = 0$

(5) $y'' - y = \sinh 2x$

2. Find the general solution of the given system. (20%)

$$\frac{dx}{dt} = 3x - y - z$$
$$\frac{dy}{dt} = x + y - z$$
$$\frac{dz}{dt} = x - y + z$$

3. The given matrix $\mathbf{A}$ is symmetric. Find an orthogonal matrix $\mathbf{P}$ that diagonalizes $\mathbf{A}$ and the diagonal matrix $\mathbf{D}$ such that $\mathbf{D} = \mathbf{P}^T\mathbf{A}\mathbf{P}$ (20%)

$$\mathbf{A} = \begin{bmatrix} 5 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 7 \end{bmatrix}$$

4. IF $\vec{F} = xy\vec{i} + y^2z\vec{j} + z^3\vec{k}$ evaluate $\iint_S (\vec{F}\cdot\vec{n})\,dS$, where S is the unit cube defined by $0 \le x \le 1$, $0 \le y \le 1$, $0 \le z \le 1$. (15%)

◀注意背面尚有試題▶

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5. Use Stokes' theorem to evaluate $\oint_C \vec{F} \cdot d\vec{r}$, $\vec{F} = (2z + x)\vec{i} + (y - z)\vec{j} + (x + y)\vec{k}$; C the triangle with vertices (1,0,0), (0,1,0), (0,0,1).

(15%)