淡江大學九十一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

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本試題共 壹 頁

1. Solve $2\sin(y^2)dx + xy\cos(y^2)dy = 0, y(2) = \sqrt{\pi/2}$. (15%)

2. Use Laplace transform to solve the system

$$x' = 3x + 3y + 8$$
$$y' = x + 5y + 4e^{3t}$$
$$x(0) = 5/3, y(0) = 11/3 \quad (20\%)$$

3. If $\vec{F} = (3x^2 - 6yz)\vec{i} + (2y + 3xz)\vec{j} + (1 - 4xyz^2)\vec{k}$, evaluate line integral $\int_C \vec{F} \cdot d\vec{r}$ along the straight lines from (0, 0, 0) to (0, 0, 1), then to (0, 1, 1), and then to (1, 1, 1). (15%)

4. Find an orthogonal matrix to diagonalize A.

$$A = \begin{bmatrix} 1 & 0 & \sqrt{2} \\ 0 & 2 & 0 \\ \sqrt{2} & 0 & 0 \end{bmatrix}. \quad (15\%)$$

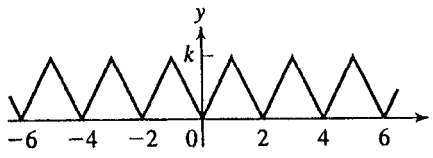
5. Solve the boundary-value problem

$$\frac{\partial^2 y}{\partial t^2} = \frac{\partial^2 y}{\partial x^2} + 9 \qquad (0 < x < 4, t > 0)$$

$$y(0,t) = y(4,t) = 0 \qquad (t > 0) \quad (20\%)$$

$$y(x,0) = \frac{\partial y}{\partial t}(x,0) = 0 \qquad (0 < x < 4)$$

6. Find the phase angle form of the Fourier series of the function, part of whose graph is shown in Fig. 1.



(15%)