系所類別	科目	節次	准考證號碼 (考生請填入)	考試 日期
電機工程系碩士班（電機組）	工程數學	第一節		100/4/24

※答案須寫在答案卷內，否則不予計分。

一、Find the solutions of the following differential equations.

(1) $4ydx + 3xdy = 0$ (5%)

(2) $(2x - y)dx + (y^2 - x)dy = 0$ (5%)

(3) $\dfrac{dy}{dx} = \dfrac{2x + y}{x + 2y}$ (10%)

(4) $y'' + 4y' + 4y = 0$ (5%)

(5) $y''' + y'' - 2y = 0$ (5%)

二、Find the Laplace Transforms of the following functions.

(6) $f(t) = 4t - e^{2t}$ (5%)

(7) $f(t) = 6\sin 2t - 5\cos 3t$ (5%)

(8) $f(t) = e^{-t}\sin(5t)$ (5%)

三、Find the inverse Laplace Transforms of the following functions.

(9) $F(s) = \dfrac{5s}{s^2 + 3}$ (5%)

(10) $F(s) = \dfrac{2}{s^3} + \dfrac{1}{s - 2} + \dfrac{3}{s^2 + 4}$ (5%)

(11) $F(s) = \dfrac{5}{s^2 + 2s + 5}$ (5%)

(12) $F(s) = \dfrac{3s}{s^2 + 2s - 8}$ (10%)

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四、Find the Fourier series of the following function.

(13) Let f(x) be periodic function with period 2π and $f(x) = \begin{cases} -1, & -\pi < x < 0 \\ 1 & 0 < x < \pi \end{cases}$。(10%)

五、Find the following solutions.

(14) If matrix A$= \begin{bmatrix} 1 & 2 & 3 \\ 2 & 0 & 1 \\ 2 & 3 & 1 \end{bmatrix}$, Find the determinant of A(i.e. Find $|A|$)。(5%)

(15) Show that the vectors A=[1,0,1], B=[1,1,0] and C=[0,0,1] are linearly independent。(5%)

(16) Find the eigenvalues and associated eigenvectors of matrix A$= \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$。(10%)