

明新科技大學 99 學年度研究所考試入學招生 試題卷

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		99/5/2

※答案須寫在答案卷內，否則不予計分。

一、Find the solutions of the following differential equations.

(Don't use Laplace transforms to solve them.)

(1) $2y' = 3x$ (5%)

(2) $y'' + 2y' + 4y = 0$ (5%)

(3) $y'' - y = 2$, $y(0) = 2$, $y'(0) = 0$ (7%)

(4) $\frac{dy}{dx} = \frac{y-x+1}{2y-2x+5}$ (8%)

(5) $dy + \frac{2}{x}y dx = 2x dx$ (10%)

二、Find the Laplace transforms of the following functions.

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

(7) $f(t) = e^{-2t} \cdot \sin(4t)$ (5%)

(8) $f(t) = t \cdot \sin(2t)$ (5%)

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

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

(10) $F(s) = \frac{5}{s^2 + 2s + 5}$ (5%)

(11) $F(s) = \frac{e^{-2s}}{s^2}$ (5%)

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四、Find the smallest positive periods of the following functions.

(12) $\sin(0.2x) + \cos(0.5x)$ (5%)

(13) $2\sin(2x) + 4\cos(3x)$ (5%)

五、Find the Fourier series of the following function.

(14) Let $f(x)$ be periodic with period 2π and $f(x) = x$, $-\pi \leq x < \pi$ (10%)

六、Find the following solutions.

(15) if matrix $A = \begin{bmatrix} 1 & -2 \\ 2 & 1 \end{bmatrix}$, find the inverse of matrix $A (=A^{-1})$ (5%)

(16) if matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 2 \end{bmatrix}$, find the rank of matrix A (5%)

(17) Find the eigenvalue of $A = \begin{bmatrix} 1 & -2 \\ -8 & 1 \end{bmatrix}$ (5%)