

國 立 宜 蘭 大 學

1 0 3 學 年 度 轉 學 招 生 考 試

(考生填寫)

准考證號碼：

工 程 數 學 試 題

《作答注意事項》

- 1.請先檢查准考證號碼、座位號碼及答案卷號碼是否相符。
- 2.考試時間：80 分鐘。
- 3.本試卷共有選擇題 4 題，非選擇題 6 題，一題 10 分，共計 100 分。
- 4.請將答案寫在答案卷上（於本試題上作答者，不予計分）。
- 5.考試中禁止使用手機或其他通信設備。
- 6.考試後，請將試題卷及答案卷一併繳交。
- 7.本試卷採雙面影印，請勿漏答。

I. 選擇題(40%)

1. () Please identify linear of following differential Equation. Verify that the given function is the solution.(a,b,c are arbitrary constant)

(A) $y' + 2y = 4(x^2 + 1)^2$, $y = e^{5x} + 2x^2 + 2x + 1$ (B) $y'^2 = -\frac{y}{x}$, $xy = c$

(C) $y' + \frac{x^2 - y^2}{2xy} = 0$, $y^2 = ax - x^2$ (D) $(y')^2 - xy' + y = 0$, $y = cx - c^2$

(E) $y' + y = x^2 - 2$, $y = ce^{-x} + x^2 - 2x$ (10%)單選

2. () $L\{t \cos(2t)\} = (s^2 - 4) \cdot G(s)$, Please find $G(s)$ from the following (A) s^{-2} (B)

$(s^2 - 1)^2$ (C) $(s^2 - 1)^{-2}$ (D) $(s^2 + 4)^2$ (E) $(s^2 + 4)^{-2}$ (10%)單選

3. () Let $f(t) = a_0 + \sum_{n=1}^{\infty} (a_n \cos(\frac{n\pi t}{L}) + b_n \sin(\frac{n\pi t}{L}))$ be Fourier series representation of

function $f(t)$. Which of the following statements is true? (A) $a_0 = \frac{1}{L} \int_{-L}^L f(t) dt$ (B) If

$f(t)$ is an odd function, then $b_n = 0$ for all n (C) $b_n = \frac{1}{L} \int_{-L}^L f(t) \sin(\frac{n\pi t}{L}) dt$ (D)

$a_n = \frac{2}{L} \int_{-L}^L f(t) \cos(\frac{n\pi t}{L}) dt$ (E) If $f(t)$ is an even function, then $b_n = 0$ for all n

(10%)單選

4. () Please identify all the even function ($f(x) = f(-x)$) in the following (A) e^x (B) e^{-x^2}

(C) $\sin nx$ (D) $x \sin x$ (E) $\frac{\cos x}{x}$ (F) $\ln x$ (10%)複選

II. 非選擇題(60%)

1. Solve $y'' + 6y' + 5y = 0$, $y(0) = 0$, $y'(0) = 3$. (10%)

2. Solve $xy' + y = 0$, $y(2) = -2$ (10%)

3. Find the Inverse Laplace transform. 1. $L^{-1}\{\frac{s}{s^2 + 4s + 13}\}$. 2. $L^{-1}\{\frac{1}{(s+2)(s+1)}\}$ (10%)

4. Find the Laplace transform $L\{f(t)\}$ for the following function: (1) $f(t) = \frac{1}{3}e^{-4t} + e^{3t}$,

(2). $f(t) = e^{2t} \sinh t$. (10%)

5. Find the inner product $\vec{A} \cdot \vec{B}$ and the angle between two vector $\vec{A} = 3\vec{i} + \vec{k}$,

$\vec{B} = -\vec{i} + \vec{j} - 4\vec{k}$ (10%)

6. Find the value of line integral $\int_C \vec{F} \circ \vec{r}'(t) dt$ when $\vec{F}(\vec{r}) = -y^2\vec{i} - xy\vec{j}$, and C:

$$\vec{r}(t) = \cos t\vec{i} + \sin t\vec{j}, 0 \leq t \leq \pi/2 (10\%)$$