

國立成功大學

113學年度碩士班招生考試試題

編號：114

系所：工程科學系

科目：工程數學

日期：0202

節次：第3節

備註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Solve the non-homogeneous Euler-Cauchy Equation (20%)

$$(3x - 1)^2 y'' + 6(3x - 1)y' = 6x + 7$$

2. Using the Laplace transform solves the ODE. (20%)

$$y'' + 9y = 3\delta(t - 3); y(0) = 1, y'(0) = 3 \quad \text{PS: } \delta(t - 3) \text{ is a unit impulse function.}$$

3. Let $f(t) = |t|$, $|t| < \pi$, the periodic is $T = 2\pi$. Find the Fourier series. (20%)

4. For the same-order square matrices A, B, and C, which of the following is incorrect?

Please correct it. (10%)

(a) $(A+B)C = CA + CB$

(b) $(AB)^{-1} = B^{-1}A^{-1}$

(c) $(kA)^T = kA^T$ k is a scalar

(d) $|AB| = |BA| = |A||B|$

(e) $(A+B)^2 = A^2 + 2AB + B^2$

(f) $(ABC)^T = A^T B^T C^T$

(g) $AB = BA$

(h) $AB = AC \Rightarrow B = C$

5. According to the Green's theorem, evaluate the counterclockwise integral (10%)

$$\oint_C (x^3 + 2y)dx + (y^3 + 3x)dy, \text{ where } C \text{ is the circle } x^2 + y^2 - 1 = 0$$

6. Using eigenfunction expansion method, solve the partial differential equation: (20%)

$$\frac{\partial^2 y}{\partial t^2} = k^2 \frac{\partial^2 y}{\partial x^2} \quad (0 < x < \ell, t > 0)$$

$$\text{Where } y(0, t) = y(\ell, t) = 0, t > 0, \quad y(x, 0) = f(x), \frac{\partial y(x, 0)}{\partial t} = g(x)$$