

國立成功大學
110學年度碩士班招生考試試題

編 號： 115

系 所： 工程科學系

科 目： 工程數學

日 期： 0203

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 ODE. (20%)

$$y'' + \frac{2y'}{x} - \frac{2y}{x^2} = \frac{3}{x}$$

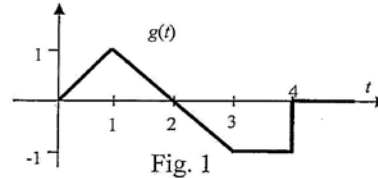
(a) Find the $y_h = ?$

(b) Find the y_p (using variation in parameter) and general solution ($y = y_h + y_p$)

(c) Find the y_p (using underdetermined coefficient method) and general solution.

PS: y_h : homogeneous solution; y_p : non-homogeneous solution

2. As Fig.1, Using the **Unit step function** show the $g(t)$ and finds the Laplace transform $L[f(t)]$: (15%)



3. Solve the PDE. (25%)

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} + 2 ; u(0, t) = u(\pi, t) = 0 ;$$

$$u(x, 0) = 0 \quad \text{when } x \in [0, \pi/2) \text{ and}$$

$$u(x, 0) = \sin 2x \quad \text{when } x \in (\pi/2, \pi]$$

4. The matrix C is $\begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 1 \\ 2 & 0 & -1 \end{bmatrix}$ under the basis (基底) of $\begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$, $\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$, and $\begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$. Find a similarity matrix A under unit basis. (20%)

5. Find $\int_{(0,0,2)}^{(2,\pi,1)} (e^x \cos y + yz)dx + (xz - e^x \sin y)dy + (xy + z)dz$ (20%)