

# 國立成功大學

## 113學年度碩士班招生考試試題

編號：176、186、195

系所：電機工程學系  
電腦與通信工程研究所  
電機資訊學院-微電、奈米聯招

科目：工程數學

日期：0201

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. (20%) Please solve  $(y - 1)y'' + (y')^2 - y' = 0$ .

2. (20%) Solve  $2 \sin(at) * \cos(at)$  (\* is the convolution operator).

3. (20%) Solve the following Neumann problem

$$\nabla^2 u(x, y) = 0 \text{ for } x^2 + y^2 < 4$$

$$\frac{\partial u}{\partial n}(x, y) = xy^2 \text{ for } x^2 + y^2 = 4$$

Note that  $\frac{\partial u}{\partial n}(x, y)$  denotes the normal derivative of  $u$ .

4. (20%) Find  $u(x, t)$  which satisfies

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

$$u(0, t) = u(8, t) = 0 \text{ for } t > 0;$$

$$u(x, 0) = \sin\left(\frac{\pi x}{8}\right) + \sin(8\pi x) \text{ for } 0 < x < 8$$

5. (20%) Using the d'Alembert's solution to solve the following differential equation.

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2} \text{ for } -\infty < x < \infty, t > 0$$

$$u(x, 0) = f(x), \frac{\partial u}{\partial t}(x, 0) = g(x) \text{ for } -\infty < x < \infty$$