

國立成功大學

110學年度碩士班招生考試試題

編 號：176、199

系 所：電機工程學系
電機資訊學院-微電、奈米聯招

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. Please solve the differential equation (20%)

$$(x^2 + 2xy - y^2)dx + (y^2 + 2xy - x^2)dy$$

2. Solve the following differential equation with zero initial condition. (20%)

$$t^2 y''(t) - 2ty'(t) + 2y(t) = \cos(2 \ln(t)), \quad t > 0$$

3. Solve the following differential equation (10%)

$$xy'' - 4y' = x$$

4. Find the value of $\frac{1}{2} + \ln \left[\frac{x(0.5) - y(0.5)}{3} \right]$ by solving the initial value problem for the given system of differential equations, where $H(t-a)$ is unit step function or Heaviside function. Show the details. (20%)

$$\begin{cases} x' - 2x + 4y = H(t-1) \cdot e^t \\ -x + y' + 3y = H(t-1) \cdot e^t \end{cases}$$

$$x(0) = 3, y(0) = 0$$

5. Let vector field $\mathbf{F} = -yi + xyj - xyzk$. Evaluate the value of $-2 + \sqrt{\frac{1}{\pi} \iint_{\Sigma} (\nabla \times \mathbf{F}) \cdot \mathbf{n} d\sigma}$, where Σ is the part of the cone $z = \sqrt{x^2 + y^2}$ for $0 \leq x^2 + y^2 \leq 9$. Show the details. (20%)

6. Evaluate $\int_0^{\infty} \frac{x^{1/3}}{\pi x(x^2 + 1)} dx$. (10%)