

國立臺北科技大學 103 學年度碩士班招生考試

系所組別：1201、1202、1203 製造科技研究所

第二節 微分方程 試題

第一頁 共一頁

注意事項：

1. 本試題共五大題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Solve the differential equation (20%)

$$\frac{dy(t)}{dt} + 3t^2y(t) = e^{-t^3-t} \text{ and } y(0) = y_0$$

2. Solve the Bernoulli equation (20%)

$$y' - 6xy = xy^3$$

3. Solve the differential equation using Laplace transformation (20%)

$$y'' + 9y = f(t) \text{ and } y(0) = y'(0) = 0$$

$$f(t) = \begin{cases} 0, & t < 2 \\ t, & t \geq 2 \end{cases}$$

4. Use the Frobenius method to solve the following differential equation. (20%)

$$4xy''(x) + 2y'(x) + y(x) = 0$$

5. Consider there is a vibrating string with zero initial velocity, the wave function is expressed as following, and the length of the string is L . The both ends of the string are fixed to the wall.

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

And the initial displacement of the string is $y(x, 0) = 2 \sin\left(\frac{3\pi x}{L}\right)$

Please solve for the boundary value problem using separation of variables. (20%)