110MT01

國立臺北科技大學 110 學年度碩士班招生考試

系所組別：1201 製造科技研究所

第一節　微分方程　試題（選考）

注意事項：

1. 本試題共 5 題，每題 15-25 分，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
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 following differential equation: (15pts)

$x - xy - y' = 0$

2. DE: $2y + 3xy' = 0$
   (1) Show that the above differential equation is not exact. (5pts)
   (2) Find the integrating factor of the form $x^a y^b$. (10pts)
   (3) Find the general solution of the differential equation. (10pts)

3. Solve the following initial value differential equation: (15pts)

$xy' + y - e^x = 0, \quad y(1) = e$

4. Solve the following differential equation: (20pts)

$x^2 y'' - xy' - y = \dfrac{1}{x+1}$

5. Please solve the following boundary value problem: (25pts)

PDE $\dfrac{\partial^2 u}{\partial x^2} = \dfrac{\partial^2 u}{\partial t^2} + u, \quad 0 < x < \pi, t > 0$

BC $\begin{cases} u(0,t) = 0 \\ u(\pi,t) = 0 \end{cases}$

IC $\begin{cases} u(x,0) = f(x) = \begin{cases} x & 0 < x < \pi/2 \\ \pi - x & \pi/2 < x < \pi \end{cases} \\ \dfrac{u(x,0)}{\partial t} = 0 \end{cases}$