

10ME01

國立臺北科技大學 110 學年度碩士班招生考試

系所組別：1111、1112 機械工程系機電整合碩士班甲組

第一節 工程數學 試題

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注意事項：

1. 本試題共 5 題，每題 20 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. Please solve the following the differential equation:

(1) $2 \sin y dx + \cos y dy = 0$, $y(0) = \frac{\pi}{2}$ (10 pts)

(2) $x^3 y''' + 5x^2 y'' + 2xy' - 2y = 0$ (10 pts)

2. Using the Laplace transform to solve the initial value problem (20 pts)

$ty'' + (t-1)y' + y = 0$; $y(0) = 0$

3. (1) Obtain the Fourier series representation of the function $f(x)$,

$f(x+4) = f(x)$ and $f(x) = \begin{cases} x+2 & \text{for } -2 < x < 0 \\ 1 & \text{for } 0 < x < 2 \end{cases}$. (15 pts)

(2) Use the result from (1) to calculate $\sum_{m=1}^{\infty} \frac{1}{(2m-1)^2}$. (5 pts)

4. (1) Use Gauss elimination to solve the following system equation (10 pts)

$$\begin{cases} 2x_1 + 6x_2 + x_3 = 7 \\ x_1 + 2x_2 - x_3 = -1 \\ 5x_1 + 7x_2 - 4x_3 = 9 \end{cases}$$

(2) Write set of linear equations in (1) as $\mathbf{Ax} = \mathbf{c}$. Find \mathbf{A}^{-1} and use this to solve

for \mathbf{x} . (10 pts)

5. Please solve the following PDE. (20 pts)

PDE $\frac{\partial u(x,t)}{\partial t} = \frac{\partial^2 u(x,t)}{\partial x^2} - 2$ ($0 < x < 1$, $t > 0$)

BC $\begin{cases} u(0,t) = 0 \\ u(1,t) = 2 \end{cases}$ ($t > 0$)

IC $u(x,0) = x^2 + x + \sin^3(\pi x)$ ($0 < x < 1$)