



南台科技大學 101 學年度研究所考試入學招生考試

系組： 機械系、奈米所、能源所

准考證號碼：

科目： 工程數學(123)

(請考生自行填寫)

注意事項	<p>一、請先檢查准考證號碼、報考系(組)別、考試科目名稱，確定無誤後再作答。</p> <p>二、所有答案應寫於答案紙上，否則不予計分。</p> <p>三、作答時應依試題題號，依序由上而下書寫，作答及未作答之題號均應抄寫。</p>
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- Find the general solution of the differential equation $y' + y = (x + 1)^2$ (10%)
- Please use Laplace transform to solve the following O.D.E. (15%)
 $y'' + 6y' + 8y = e^{-3t}$, $y(0) = y'(0) = 0$
- $\mathcal{L}^{-1} \left\{ \frac{6}{s-4} + \frac{1}{2s-3} + \frac{2}{s^2+4} \right\}$ (10%)
- $\frac{\partial u}{\partial t} = \alpha \frac{\partial^2 u}{\partial x^2}$, $0 < x < a$, $t > 0$ (15%)
 B.C. $u(0, t) = 0$, $u(a, t) = 0$
 I.C. $u(x, 0) = f(x)$
- Find the eigenvalues and eigenvectors of the matrix and diagonalize it. (15%)

$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 1 \\ 0 & 1 & 3 \end{bmatrix}$$
- Evaluate $\oint_C \mathbf{F}(\mathbf{r}) \cdot d\mathbf{r}$, where $\mathbf{F} = (x^2 + y^2) \mathbf{i} + 3xy \mathbf{j}$, C : counterclockwise around the boundary of the triangle with vertices $(0, 0)$, $(1, 0)$, $(0, 1)$. (15%)
- Find the Fourier series of the function $f(x) = |x|$ if $-1 < x < 1$, $f(x+2) = f(x)$. (10%)
- Represent $\frac{2^i}{1+i}$ in the form $a + bi$, where a and b are real numbers and $i = \sqrt{-1}$. (10%)