

國立中山大學 107 學年度碩士暨碩士專班招生考試試題

科目名稱：工程數學【海下所碩士班】

題號：454001

※本科目依簡章規定「不可以」使用計算機(問答申論題)

共 1 頁第 1 頁

- For the initial value problem: $y' = 3x^2(y + 2)$, $y(2) = 8$
 - (7%) Find the general solution.
 - (8%) Find the particular solution.
- For the initial value problem: $y'' + 36y = 0$, $y(0) = 2$, $y'(\frac{\pi}{2}) = 3$
 - (7%) Find the general solution.
 - (8%) Find the particular solution.
- For the system: $\mathbf{X}' = \begin{pmatrix} 4 & 2 \\ 3 & 3 \end{pmatrix} \mathbf{X}$
 - (6%) Find the eigenvalues.
 - (6%) Find the eigenvectors.
 - (3%) Find the general solution.
- (15%) A particle moves once counterclockwise about the rectangle with vertices $(0, 1)$, $(1, 1)$, $(1, 3)$ and $(0, 3)$, under the influence of the force $\vec{F} = (x^2 - y)\hat{i} + (x - y^2)\hat{j}$. Calculate the work done by this force.
- (2%) Find the length of the vector $[3, 1]^T$.
 - (4%) Find the angle between the two vectors $[1, 2]^T$ and $[1, 4]^T$.
 - (4%) Find k so that these two vectors $[k, 1]^T$ and $[4, 3]^T$ are perpendicular.
- (10%) If $A = (5, 0, 7)$ and $B = (2, -3, 6)$, find the points P on the line AB which satisfy $AP/PB = 3$.
- (10%) Assuming that a person walking eastward at a speed of 4 kilometers per hour finding that the wind appears blow directly from the north. On doubling his speed, the wind appears to come from the north east. What was the vector velocity of the wind?
- (10%) Find the rational number m for which the following matrix is singular:
$$\mathbf{A} = \begin{bmatrix} 3 & 1 & 2 \\ 5 & m & -3 \\ -1 & -7 & -2 \end{bmatrix}$$