國立雲林科技大學 107 學年度 碩士班招生考試試題

系所：機械系

科目：工程數學(1)

1. **(25%)** Please find the general solution of the following ordinary differential equation (O.D.E.):

$$y' = \frac{y + x}{x}$$

2. Consider the 2nd order O.D.E.

$$y'' + 2y' + y = f(t), \qquad y(0) = y'(0) = 0$$

y is a function of t. Please find the initial value problems for all $t \geq 0$ according to each $f(t)$ as follows.

(a) $f(t) = 1$ for all $t \geq 0$ **(10%)**

(b) $f(t) = \begin{cases} 1 & 0 \leq t \leq 1 \\ 0 & otherwise \end{cases}$ **(15%)**

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Prob. 3 (10%)

Find the directional derivative of f(x,y,z) = sin(x – y + 2z) at (3.2, –1.1, –3.0) in the direction of $-\vec{i}+\vec{j}+\vec{k}$

Prob. 4 (15%)

Find an equation of the tangent plane to the surface of $2x - \cos(xyz) = 3$ at (1, π, 1).

Prob. 5 (25%)

Calculate the work done by the force $\vec{F}(t)=\vec{i}-x\,\vec{j}+\vec{k}$ in moving a particle from (1,0,1) to (–1,0,π) along the curve x = cos(t), y =sin(t), z = t.