

國立中央大學 109 學年度碩士班考試入學試題

所別： 土木工程學系 碩士班 力學與結構工程組(一般生)

共 / 頁 第 / 頁

科目： 工程數學

本科考試禁用計算器 *計算題需計算過程，無計算過程者不予計分

*請在答案卷(卡)內作答

1. 求方向導數

$$f = 1/\sqrt{x^2 + y^2 + z^2} = (x^2 + y^2 + z^2)^{-\frac{1}{2}}, \text{ 在 } P:(3, 0, 4), \text{ 沿著方向 } \vec{a} = [1, 1, 1]$$

(25%)

2. 請證明 $\text{rank}(B^T A^T) = \text{rank}(AB)$

(25%)

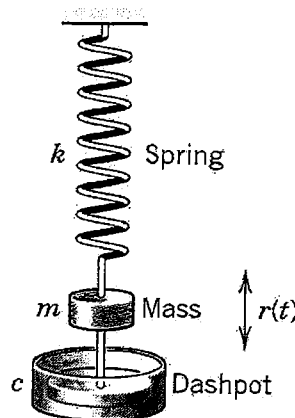
3. For Spring-damping-mass system as shown following,

(1). please conduct resonance behavior as $c = 0$ and external force $r(t) = F_0 \cos \omega_0 t$, where $m\omega_0^2 = k$; (10%)

(2). please find the maximum amplitude and corresponding ω_{\max} of the damped system ($c^2 < 2mk$) at steady-state as the external force $r(t) = F_0 \cos \omega t$ (20%)

(3). based on previous questions, please find the relationship between the maximum amplitude of the damped system and resonance behavior of the un-damped system (5%)

4. Please using the series method to find the Legendre polynomial and function of $(1 - x^2)y'' - 2xy' + n(n+1)y = 0$ as $y(1)=1$ and $n=4$ (15%)



參考
用