所別： 土木工程學系 碩士班 力學與結構工程組(一般生)　　
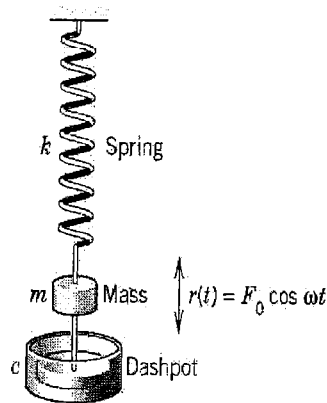
科目： 工程數學

＊本科考試禁用計算器

＊皆為計算題，請詳列計算過程，無計算過程者不予計分

1. A undamped (c=0) system as shown in figure, please conduct the mass displacement as $y(0) = y'(0) = 0$, and :

   (1) the ω of external force r(t) is close to the system frequency $\omega_0 = \sqrt{k/m}$ (10%)

   (2) the ω of external force r(t) equals the system frequency ω_0 (10%)

   (3) please explain the "Resonance" with the undamped system and the "Amplification" with the damped system (5%)

2. $(x - 2)y'' - (4x - 7)y' + (4x - 6)y = 0$

Given one solution $y_1 = e^{2x}$, find another solution y_2 and verify the solutions are linearly independent or not. Solve the ODE's general solution. (25%)

注意：背面有試題

3. Find the $|A^5|$ (25%)

where $A = \begin{bmatrix} 4 & 2 & -2 \\ 2 & 5 & 0 \\ -2 & 0 & 3 \end{bmatrix}$

4. $B = \begin{bmatrix} 3 & 1 & 0 \\ 0 & 3 & 4 \\ 0 & 0 & 4 \end{bmatrix}$

假設 λ 為矩陣 B 的特徵值

求 $\lambda_1{}^2 + \lambda_2{}^2 + \lambda_3{}^2$ (25%)

注意：背面有試題