

國立中央大學 112 學年度碩士班考試入學試題

所別： 土木工程學系碩士班

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科目： 工程數學

計算題需計算過程，無計算過程者不予計分

1. Given that e^{2x} is a solution of $(x + 2)y'' - (2x + 5)y' + 2y = 0$.

Please find the general solution to the following nonhomogeneous differential equation.(25%)

$$(x + 2)y'' - (2x + 5)y' + 2y = (x + 1)e^x ; y(0) = y'(0) = 1$$

2. Please using the series method to find the Legendre polynomial P_5 of $(1 - x^2)y'' - 2xy' + 30y = 0$ as $y(1)=1$ (10%)

3. Use Laplace method to solve the spring-damping system as $m=1$ kg, $c=4$ kg/s, $k=4$ kg/s², $y(0)=0$, $y'(0)=0$ with external force = $\exp(-2t)$ as $0 < t < 1$ (15%)

4. Find the A^5 (25%)

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

5. Please describe the relationship between Green's Theorem in the Plane and Stokes' Theorem (25%)