

國立中央大學 109 學年度碩士班考試入學試題

所別：大氣科學學系大氣物理 碩士班 不分組(一般生)  
大氣科學學系大氣物理 碩士班 不分組(在職生)

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科目：應用數學

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. Solve the following initial value problems.

a.  $y'' - 4y' + 3y = 10 \cos x$ ,  $y(0) = 1$ ,  $y'(0) = -1$ ;

b.  $(x^2 D^2 + xD - I)y = 16x^3$ ,  $y(1) = -1$ ,  $y'(1) = 1$

(30%)

2. Find the inverse Laplace transform of the following functions

a.  $\frac{s \sin \theta + \omega \cos \theta}{s^2 + \omega^2}$ ,

b.  $\frac{3s}{s^2 - 2s + 2}$

(10%)

3. Evaluate the following integral by the divergence theorem.

$$\mathbf{F} = [ax \quad by \quad cz], \quad S \text{ the sphere } x^2 + y^2 + z^2 = 36$$

(15%)

4. Is the given matrix Hermitian? Skew-Hermitian? Unitary? Find its eigenvalues and eigenvectors.

$$\begin{bmatrix} \frac{1}{4} & i\sqrt{2} \\ i\sqrt{2} & \frac{1}{4} \end{bmatrix}$$

(15%)

5. Find (a) the Fourier cosine series, (b) the Fourier sine series of the following function

$$f(x) = \sin x, \quad 0 < x < \pi$$

(15%)

6. Solve for  $u = u(x, y)$ :

$$u_{xx} + u_x = 0, \quad u(0, y) = f(y), \quad u_x(0, y) = g(y)$$

(15%)

參考用