國立高雄應用科技大學
106 學年度研究所碩士班招生考試
機械工程系碩士班
工程數學(乙組)

注意： a.本試題共 10 題，共 100 分。
　　　 b.作答時不必抄題。
　　　 c.考生作答前請詳閱答案卷之考生注意事項。

1. Find the general solution: (10%)

$$9yy' + 36x = 0$$

2. Find the general solution: (10%)

$$(y + \cos x + 1)dx + (x + \sin y + 1)dy = 0$$

3. Solve the initial value problem: (10%)

$$y'' + 4y' + 2y = 0 \quad y(0) = 0,\ y'(0) = 1$$

4. Find the general solution: (10%)

$$y'' - 7y' + 12y = \cos 5x$$

5. Find the Laplace transform: (10%)

$$f(t) = 3 + 5t - 7e^{2t}$$

6. Find the inverse Laplace transform: (10%)

$$F(s) = \frac{s}{s^2 - s - 6}$$

7. Solve by the Laplace transform: (10%)

$$y'' - 7y' + 12y = e^{2t} \quad y(0) = 0, \; y'(0) = 0$$

8. Determine the inverse B^{-1} of: (10%)

$$B = \begin{bmatrix} 2 & 1 & -1 \\ 1 & -3 & 1 \\ 1 & 3 & -3 \end{bmatrix}$$

9. Find the Eigenvalues and Eigenvectors of: (10%)

$$A = \begin{bmatrix} 4 & 0 & 0 \\ 2 & 3 & 1 \\ 0 & 0 & 1 \end{bmatrix}$$

10. Find the directional derivative of $f(x, y, z) = x^2 + 2y^2 + 3z^2$ at

$A : (2,1,1)$, in the direction of $\vec{a} = (2,0,3)$: (10%)