

國立高雄應用科技大學  
107 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(甲組)

試題 共 1 頁，第 1 頁

注意：a. 本試題共 5 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. Please calculate the following differential equations

(a)  $y' + 2\sin 2\pi x = 0$  (10%)

(b)  $(x^2 + y^2)dx - xydy = 0$  (10%)

(c)  $y'' + 4y = 8x^2, y(0) = -3, y'(0) = 0$  (10%)

2.  $L\{f(t)\}$  means Laplace transform of  $f(t)$ . Find the solution of following equations

(a)  $L\{4e^{5t} + 6t^3 - 3\sin 4t + 2\cos 2t\} = ?$  (15%)

(b) Please solve initial value problem by convolution theorem (Laplace method) as following:

$y'' + y' - 6y = 0, y(0) = 1, y'(0) = 1$  (15%)

3. Find the eigenvalues and eigenvectors of the following matrices. (use the given  $\lambda$  or factors)

$$\begin{bmatrix} 6 & 5 & 2 \\ 2 & 0 & -8 \\ 5 & 4 & 0 \end{bmatrix}$$
 (15%)

4. Find the volume of the tetrahedron with vertices (10%)

$(4, 2, 0), (10, 4, 0), (5, 4, 0), (11, 6, 0)$

5. Find the normal vector of the surface at a given point P (15%)

$6x^2 + 2y^2 + z^2 = 225, P: (5, 5, 5)$