國立台灣海洋大學九十三學年度研究所碩士班招生考試試題

系所名稱：河海工程學系碩士班(大地A組)　　*答案以橫式由左至右書寫於答案卷上！

科目名稱：工程數學

1. Find the general solution y(x) of the following equations:

(1) $By + Dy' + Ey'' = 0$, where B, D, E are constants (15%)

(2) $y + 2y' + 3y'' = 1 + 2x$ (10%)

2. Using the Laplace Transform method to solve the Euler equation (15%)

$x^2 y'' + 5xy' + 4y = 0$, $y(1) = 2$, $y'(1) = 2$

3. Write the following function values in the complex form of: a + bi (10%)

(a). e^{2+2i} (b). Sin(3+3i)

4. Using Cauchy's Theorem to evaluate the complex integration: $\oint_C \frac{2z+1}{z^2+3iz} dz = ?$ (15%)

Where C is the circle $|z + 3i| = 3$ (i.e. z = x + iy and $x^2+(y+3)^2 = 9$) of radius 3 and center (0, -3i).

5. $\begin{cases} X_1 + X_2 + X_3 = 2 \\ 2X_1 + 4X_2 + 3X_3 = 3 \\ 2X_2 + 3X_3 = 7 \end{cases}$ (20%)

(1) Write the system of equations in matrix form AX=B

(2) Calculate the eigen-values and eigen-vectors of matrix A

(3) Find the Inverse matrix A^{-1}

(4) Solve $X=A^{-1}B$

6. $f(t) = \begin{cases} Sin(t) & for \quad 0 \le t < 2\pi \\ 0 & for \quad t < 0 \ and \ for \ t \ge 2\pi \end{cases}$ (15%)

$H(t-a) = \begin{cases} 1 & for \quad t \ge a \\ 0 & for \quad t < a \end{cases}$

(1) Plot the figure [f(t) vs. t] and expressed f(t) in terms of the Heaviside function H(t)

(2) Calculate the Laplace Transform of f(t)

(3) Calculate the Fourier Transform of f(t)