國立臺灣海洋大學九十八學年度研究所碩士班暨碩士在職專班入學考試試題

考試科目： 工程數學　　**試題代碼：** 521101

系所名稱： 河工系碩士班(大地組、結構組、海工組、水環組)

1.答案以橫式由左至右書寫。2.請依題號順序作答。

1. $\begin{cases} 2X_2 + 3X_3 = 7 \\ 2X_1 + 4X_2 + 3X_3 = 3 \\ X_1 + X_2 + X_3 = 2 \end{cases}$ (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 $X=A^{-1}B$

2. $f(t)=\begin{cases} Sin(t) & for \quad 0 \le t < 2\pi \\ 0 & for \quad t<0 \ and \ for \ t \ge 2\pi \end{cases}$ (30%)

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

(1) Plot the figure of H(t-a) and f(t)

(2) Expressed f(t) in terms of the Heaviside function H(t)

(3) Find the Taylor series of f(t)

(4) Find the Laplace Transform of f(t)

(5) Find the Fourier series of f(t)

(6) Find the Complex Fourier series of f(t)

(7) Find the Fourier Integral of f(t)

(8) Find the Fourier Transform of f(t)

3. Solve the following equation: (10%)

$$\cos(x+y)\,dx+\left(3y^2+2y+\cos(x+y)\right)dy=0$$

4. Solve the Bernoulli equation: (A, B are constants) (10%)

$$y'=Ay-By^2$$

5. Solve the Euler-Cauchy equation: (10%)

$$x^2y''+1.5xy'-0.5y=0$$

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

$$y''+y=0.001x^2 \quad y(0)=0 \quad y'(0)=1.5$$

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

$$y''-y=t \quad y(0)=1 \quad y'(0)=1$$

(試題結束)