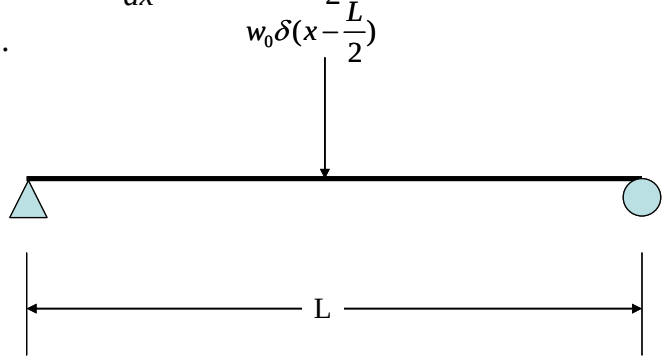
海洋大學河海工程學系九十四學年度 第二學期 ■期中 □小考 考試命題紙

考 試 科 目	開課系級	考試日期	印製份數	答案紙	命題教師	備 註
工程數學二	二 A, B	6 月 23 日	110	■ 需 □不需	陳桂鴻 呂學育	第四次大考

1. Suppose a uniform beam of length *L*. If the concentrated load is given by $w(x) = w_0\delta(x-\frac{L}{2})$, $0<x<L$, and then the differential equation for the deflection $y(x)$ is $EI\frac{d^4y}{dx^4} = w_0\delta(x-\frac{L}{2})$, where *E*, *I*, and w_0 are constants. The B. C. is given as the following figure 1. (20%)



2. Use Laplace transform to solve the given system of ODE

$$\begin{cases} \frac{d^2x}{dt^2}+\frac{dx}{dt}+\frac{dy}{dt}=0 \\ \frac{d^2y}{dt^2}+\frac{dy}{dt}-4\frac{dx}{dt}=0 \end{cases} \quad \text{S.t.} \quad \begin{cases} x(0)=1, x'(0)=0 \\ y(0)=-1, y'(0)=5 \end{cases} \quad (25\%)$$

3. Use Laplace transform to solve $\frac{d^2y}{dx^2}-2\frac{dy}{dx}-8y = f(t), y(0)=1, y'(0)=0$, where $f(t)$ is arbitrary. (15%)

4. (1) $f(t)=\cos(at)$, $g(t)=\sin(at)$, find $L\{f(t)+ig(t)\}$ with a any real number (3%)

(2) $f(t)=t\cos(at)$, $g(t)=t\sin(at)$, find $L\{f(t)+ig(t)\}$ with a any real number (5%)

(3) find $L^{-1}\left\{\frac{e^{-s}}{s(s+1)}\right\}$ (3%)

(4) $F(s)=\frac{2s+1}{s(s+1)(s^2+4s+6)}$, find $L^{-1}\{F(s)\}$ (5%)

(5) $f(t)=\begin{cases} 0, & 0\le t<\pi \\ 1, & \pi\le t\le 2\pi \\ 0, & t\ge 2\pi \end{cases}$ find $L\{f(t)\}$ (4%)

5. (1)Solve $y'+y=\delta(t-a)$, $y(0)=y_0$ using Laplace transform with $a>0$ a real number (10%)

(2)Solve $y''+y=tu(t)$, $y(0)=y_0$, $y'(0)=y_1$ using Laplace transform with $u(t)$ the unit step function (or the Heaviside function) (15%)

(3) (a) Solve $y''+y=\delta(t)$, $y(0)=0$, $y'(0)=0$ using Laplace transform (10%)

(b) discuss your result considering the zero initial conditions and the action of $\delta(t)$ (5%)