逢甲大學101年度產業碩士專班【秋季班】試題　編號：001

科目	工程數學	適用系所	通訊與IC產業碩士專班	時間	一〇〇分鐘

※請務必在答案卷作答區內作答。　　共1頁第1頁

一、 Solve the differential equation $xe^{(x^2+y^2)}dx - ydy = 0$ (10%)

二、 Solve the differential equation $\frac{d^2y}{dx^2} + 4y = \tan 2x$ on the interval $(\frac{-\pi}{4}, \frac{\pi}{4})$ (15%)

三、 Write the function of in terms of the Heaviside (or unit step) function

$$f(t) = \begin{cases} 0 & \text{if } 0 \le t < 3 \\ t + t^2 & \text{if } 3 \le t < 4 \\ 2 + t & \text{if } 4 \le t \end{cases} \quad (10\%)$$

四、 Using Laplace's transformation to solve $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 2y = \delta(t-1)$ and $y(0) = \frac{dy(0)}{dt} = 0$ (15%)

五、 If $f(x) = e^{-5x}H(x)$ where $H(x)$= unit step function.

1. Find the Fourier integral representation. (15%)

2. By using the result in (1), to evaluate (5%)

$$\int_0^\infty \frac{1}{25+\omega^2} d\omega = ?$$

六、 If $f(x) = \frac{3}{4} + 2\cos 2x + \frac{3}{2}\cos 4x + \frac{5}{2}\sin 16x$

1. Find the Fourier series expansion. (10%)

2. Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \left(\frac{3}{4} + 2\cos 2x + \frac{3}{2}\cos 4x + \frac{5}{2}\sin 16x \right)^2 dx$ =? (10%)

七、If $f(x) = \cos 4x$, please determine Fourier transform of $f(x)$. (10%)