國立中央大學 107 學年度碩士班考試入學試題

所別： 企業管理學系 碩士班 一般甲組(一般生)

科目： 工程數學

本科考試禁用計算器 ＊請在答案卷(卡)內作答

1. Find the Fourier transform of signal:

$$x(t) = \left(\frac{d}{dt}\left\{\left(e^{-2t}u(5t)\right) * \left(e^{-t}u(t+3)\right)\right\} \times e^{j2t}\right). \quad (20\%)$$

2. Find the Fourier transform of signal:

$$x(t) = te^{-3|t-1|}. \quad (20\%)$$

3. Solve the following homogeneous differential equation with the specified auxiliary conditions: (20%)

$$\frac{d^3y(t)}{dt^3} - 7\frac{dy(t)}{dt} + 6y(t) = 0, \quad y(0) = 0, \quad y'(0) = 1, \quad y''(0) = 2$$

4. For a system $h(t)$, the input $x(t) = e^{-3t}u(t)$ and the output $y(t) = e^{-t}u(t) + e^{-2t}u(t)$.

Determine the impulse response of its inverse system $h^{inv}(t)$. (20%)

5. How many signals have a Laplace transform that may be expressed as

$$\frac{(s-1)}{(s+2)(s+3)(s^2+s+1)}$$

in its region of convergence? (20%)