國立中山大學106學年度碩士暨碩士專班招生考試試題

科目名稱：工程數學【材光系碩士班乙組】　　題號：439001

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）（問答申論題）　　

1. Find the general solution of $y' = -\frac{8x^2}{y}$ (10%)

2. Find the general solution of $y''' - 3y'' + 3y' - y = 4\cos x$ (15%)

3. Use the power series method to solve $y'' + 4y = 0$ (15%)

4. Use Laplace transform to solve $y'' - 4y' + 4y = te^{2t}$, $y(0) = 1, y'(0) = 2$ (20%)

5. One-dimensional heat equation: $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$, where the constant c^2 is the thermal diffusivity. Find the temperature $u(x,t)$ in a laterally insulated copper bar of length 100 cm whose ends are kept at temperature 0, assuming that the initial temperature is

$$u(x,0) = \begin{cases} x & if \ \ 0 < x < 50 \\ 100 - x & if \ \ 50 < x < 100 \end{cases}$$

The thermal diffusivity for copper is 1.158 $(\frac{cm^2}{s})$. (20%)

6. Find the Fourier series of the given function $f(x)$, which is assumed to have the period 2π.

$$f(x) = \begin{cases} x + \pi & if \ \ -\pi < x < 0 \\ -x + \pi & if \ \ 0 < x < \pi \end{cases}$$ (20%)