

中原大學 100 學年度碩士班入學考試

3 月 19 日 10:30-12:00

機械工程學系丙組

誠實是我們珍視的美德，
我們喜愛「拒絕作弊，堅守正直」的你！

科目：工程數學

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可使用計算機，惟僅限不具可程式及多重記憶者 不可使用計算機

1. (10%) Solve the given nonlinear first-order differential equation.

$$3xydy + 5y^2dx + 2x^3dx = 0.$$

2. (15%) Find the general solution of the given differential equation.

$$y'' - 2y' + y = x^{-2}e^x + x^2. \#$$

3. (15%) Use the power series method to solve the given initial-value problem.

$$y'' - 2xy' + 8y = 0, y(0) = 2, y'(0) = 1. \#$$

4. (15%) Use the Laplace transform to solve the given system of differential equations.

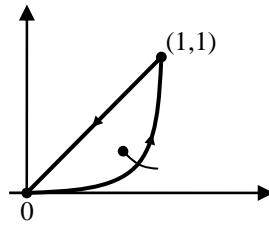
$$\begin{cases} \frac{d^2u}{dt^2} + 3\frac{dv}{dt} + 3v = 0 \\ \frac{d^2u}{dt^2} + 3v = te^{-t} \end{cases}, u(0) = 0, u'(0) = 2, v(0) = 0. \#$$

5. (15%) Find the Fourier transform of the given function.

$$f(x) = \begin{cases} xe^{-x}, & x > 0 \\ 0, & x < 0 \end{cases} \#$$

6. (15%) Evaluate $\oint_C (3y - 2x^2)dy + (5x^2 - 3y^2)dx$, where C consists of the boundary of the region

in the first quadrant that is bounded by the graphs of $y = x$ and $y = x^3$.



7. (15%) Solve the given partial differential equation.

$$\frac{\partial^3 z}{\partial x^3} - 7 \frac{\partial^3 z}{\partial x \partial y^2} - 6 \frac{\partial^3 z}{\partial y^3} = \sin(x + 2y) + e^{3x+y}. \quad \#$$