

科目	工程數學	適用系所	資訊與通訊產業碩士專班	時間	一〇〇分鐘
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※請務必在答案卷作答區內作答。

共 1 頁第 1 頁

一、 Solving the following differential equation  $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 3e^{-x}$  (15%)

二、 Evaluated  $\int_0^1 \frac{x^a - 1}{\ln x} dx = ?$  ( $a \geq 0$ ) (15%)

三、 Using Laplace transformation to solve the following initial value problem

$$\frac{d^2y}{dt^2} + 2t\frac{dy}{dt} - 4y = 1 \text{ and } y(0) = \frac{dy(0)}{dt} = 0 \text{ (10\%)}$$

四、 Solving the following differential equation  $(\frac{dy}{dx})^2 + (y-1)\frac{dy}{dx} - y = 0$  (10%)

五、 Consider the following differential equation (15%)

$$x^2 y'' + xy' + \lambda y = 0$$

with boundary condition:  $y(1) = y(e^2) = 0$ .

Please determine the eigenvalues and eigenfunctions of the equation.

六、 Consider the following wave-equation (20%)

$$\frac{\partial^2 u(x,t)}{\partial t^2} = 9 \frac{\partial^2 u(x,t)}{\partial x^2}$$

Solve the equation by separation of variable method (變數分離法)

With boundary conditions:  $u_x(0,t) = 0, u_x(5,t) = 0$

initial condition:  $u(x,0) = 3 + 2 \cos 2\pi x$ ,  $u_t(x,0) = 2 + 5 \cos 5\pi x$

七、 Solve the following differential by Fourier transform (15%)

$$y''(x) + 4y'(x) + 3y(x) = 3\delta(x-4)$$