

台灣聯合大學系統 97 學年度學士班轉學生考試命題紙

科目 應用數學 類組別 034, 033, 032

共 1 頁 第 1 頁
*請在試卷答案卷(卡)內作答

Please show the details of your work for all questions.

1. Solve the following ordinary differential equations.

- (1) $y' + 4x^2y = (4x^2 - x)e^{-x^2/2}$ (10%)
- (2) $\cos(x+y)dx + (3y^2 + 2y + \cos(x+y))dy = 0$ (10%)
- (3) $y' = (4x^2 + y^2)/(xy)$ (10%)
- (4) $2x^2y'' + 4xy' + 5y = 0$ (10%)
- (5) $y'' + 4y' + 4y = \cos 4t$ (10%)

2. Using separating of variables to solve the following partial differential equations.

- (1) $\frac{\partial^2 u(x, t)}{\partial t^2} = c^2 \frac{\partial^2 u(x, t)}{\partial x^2}, u(0, t) = u(L, t) = 0,$
 $u(x, 0) = f(x), u_x(x, 0) = 0, (0 \leq x \leq L)$ (10%)
- (2) $\frac{\partial u(x, t)}{\partial t} = c^2 \frac{\partial^2 u(x, t)}{\partial x^2}, u_x(0, t) = u_x(L, t) = 0,$
 $u(x, 0) = f(x), (0 \leq x \leq L)$ (10%)

3. Find a general solution of the system

$$\begin{cases} y_1' = 2y_1 - 2y_2 \\ y_2' = 2y_1 + 2y_2 \end{cases} \quad (10\%).$$

4. Solve the initial value problem by the Laplace transform

$$y'' + y' + 9y = 0, y(0) = 0.16, y'(0) = 0. \quad (10\%)$$

5. Find the odd periodic extension of the function (half-range expansion)

$$f(x) = \begin{cases} \frac{2k}{L}x & \text{if } 0 < x < \frac{L}{2} \\ \frac{2k}{L}(L-x) & \text{if } \frac{L}{2} < x < L \end{cases} \quad (10\%)$$