

清雲科技大學 100 學年度 研究所碩士班考試 試題

所別：電機工程研究所

考試科目：工程數學

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1. Calculate the following line integral. (10%)

$$\int_C xyz dx - \cos(yz) dy + xz dz, \quad C: x(t) = 1 - 3t, y(t) = 1, z(t) = 1 + 2t, \text{ from } (1,1,1) \text{ to } (-2,1,3).$$

2. Solve the given differential equation. (10%)

$$xy' + 3y = x \sin x$$

3. Solve the given differential equation. (15%)

$$xy' + y = \frac{1}{x^3} y^4$$

4. Solve the given second order differential equation. (15%)

$$x^2 y'' - 5xy' + 10y = 0, y(1) = 2, y'(1) = 10$$

5. Use Laplace transform to solve the given second order differential equation. (15%)

$$y'' - y' - 6y = e^{5t}, y(0) = 1, y'(0) = 0$$

6. Find the Fourier transform of  $f(t) = e^{-2t}$  if  $t > 0$  and  $f(t) = 0$  otherwise by using Fourier transform definition. (10%)

7. Solve  $u_{xy} = u_x$  for  $u = u(x, y)$  (10%)

8. Give  $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & -2 & 1 \\ 0 & 4 & 1 \end{bmatrix}$ , use the Cayley-Hamilton theorem to find  $e^{At}$ . (15%)