

逢甲大學96年度產業研發碩士專班【春季班】試題

科目	工程數學	適用 系所	積體電路產業研發碩士專班	時間	100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

1. Consider the Bernoulli equation $y' + \frac{1}{x}y = 3x^2y^3$.

(1) Let $v(x) = y^{-2}(x)$. Find $y'(x)$. (5%)

(2) Transform the Bernoulli equation into a linear equation of v with respect to x by letting $v(x) = y^{-2}(x)$. (5%)

(3) Find the general solution of the Bernoulli equation by solving the linear equation obtained in (2). (10%)

2. (1) Solve the equation $y'' - y' - 6y = 0$. (5%)

(2) Solve the equation $y'' + y' + 6y = 0$. (5%)

(3) Solve the Euler equation $x^2y'' - 5xy' + 9y = 0$. (5%)

3. The Laplace transform of $f(t)$ on $[0, \infty)$ is defined as $F(s) = \mathcal{L}[f(t)] = \int_0^{\infty} e^{-st}f(t)dt$ for all s such that the integral converges.

(1) Find $\mathcal{L}[e^{at}]$. (5%)

(2) Solve $y' + 3y = e^t, y(0) = 0$ by first applying Laplace transform to the equation. (10%)

4. Solve the following complex equation (10%)

$$z^4 = 16i$$

5. If the vectors $A = 2i - 3j$, $B = i + j - k$ and $C = 3i - k$.

Evaluate $A \cdot (B \times C)$ (10%)

6. Consider the following matrix, please answer the following questions:

$$A = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix}$$

(1) Determine the trace and transpose of the matrix A , $\text{Tr}(A)$, and A^T (10%)

(2) Find $|A|$ (5%)

(3) If $B = 2A$, find $|B|$ (5%)

(4) Determine $\sin A$ (10%)