

國立聯合大學 100 學年度碩士班考試招生

機械工程學系 入學考試試題

科目： 工程數學 第 1 頁共 1 頁

1. Find a general solution of each of the following equations: (30%)

(1) $(y+3)dx + (x + \cos y)dy = 0$

(2) $xy' + y + 2 = 0$

(3) $y'' + 2y' + y = 2e^{-x}$

2. Find the inverse of each of the following Laplace transforms: (20%)

(1) $Y(s) = \frac{s+2}{s^3 + s^2 - 6s}$

(2) $Y(s) = \frac{4}{s(s-4)^2}$

3. Let $\varphi(x, y, z) = x^2y - xe^z$. Find the gradient of φ at $(2, -1, 0)$. (10%)

4. If matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & -1 \\ 2 & 1 & 0 \end{bmatrix}$, find A^{-1} . (10%)

5. Let $f(x) = x$ for $-\pi \leq x \leq \pi$. Find the Fourier coefficients of f on $[-\pi, \pi]$. (10%)

6. Solve $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$ ($0 < x < L, t > 0$)

$$u(0, t) = u(L, t) = 0 \quad (t > 0)$$

$$u(x, 0) = f(x) \quad (0 < x < L) \quad (20\%)$$