國立嘉義大學 100 學年度

生物機電工程學系碩士班招生考試試題

科目：工程數學（※禁止使用計算機）

1. Given a matrix $A=\begin{bmatrix}2 & 1 & 1\\ 0 & 1 & 0\\ 3 & 1 & 2\end{bmatrix}$.

   (a) Find the determinant of *A*. (10%)

   (b) Find the reduced row-echolen form of *A*, that is rref(*A*)=? (10%)

   (c) Find the rank of *A*. (5%)

2. Solve systems of differential equations: $\begin{cases}\dfrac{dx}{dt}=4x+2y\\ \dfrac{dy}{dt}=2x+y+10\end{cases}$ (25%)

3. A function $y = y(x)$ satisfies that the 1st-order differential equation:

   $$x\frac{dy}{dx}-3x^3+y=0$$

   (a) Does the differential equation satisfy the “Condition of Exactness” ? (10%)

   (b) Solve the initial value problem given above for $y(1) = 5$. (10%)

4. Evaluate the followings:

   (a) the Laplace transform of the piecewise function $f(t)=\begin{cases}2, & 0\le t<2\\ -2, & t\ge 2\end{cases}$. (10%)

   (b) the inverse Laplace transform of $G(s)=\dfrac{1}{s^2(s^2+9)}$. (10%)

   (c) the inverse Laplace transform of $H(s)=\ln\dfrac{s^2+4}{s^2}$. (10%)