國立臺北科技大學105學年度碩士班招生考試

系所組別：1301、1302、1303 車輛工程系碩士班

第二節　工程數學　試題

注意事項：

1. 本試題共五題，配分共100分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. (25%) For a matrix A=$\begin{bmatrix} 5 & 7 & -5 \\ 0 & 4 & -1 \\ 2 & 8 & -3 \end{bmatrix}$,

   (1) Calculate the determinant of A. (5%)

   (2) Determine the inverse matrix of A. (5%)

   (3) Find the eigenvalues of A. (5%)

   (4) Find the eigenvectors of A. (10%)

2. (15%) Determine the position of the centroid of a sheet of metal formed by the curve $y=4x-x^2$ which lies above the x-axis.

3. (20%) Solve the differential equations:

   (1) $\left(y^2+2\right)\frac{dy}{dx}=5y$, given $y=1$ when $x=0.5$. (10%)

   (2) $2y(1-x)+x(1+y)\frac{dy}{dx}=0$, given $y=1$ when $x=1$. (10%)

4. (20%) Find the solution of initial value problem: $\frac{d^2y}{dx^2}-7\frac{dy}{dx}+10y=e^{2x}+20$, when x = 0, $y=0$ and $\frac{dy}{dx}=-\frac{1}{3}$.

5. (20%) Use Laplace transforms to solve the differential equation:

   $\frac{d^2y}{dx^2}+\frac{dy}{dx}-2y=3\cos 3x-11\sin 3x$, given $y(0)=0$ and $y'(0)=6$.