國立中央大學100學年度碩士班考試入學試題卷

所別：土木工程學系碩士班 結構組(一般生)　科目：工程數學　共 1 頁 第 1 頁

本科考試可使用計算器，廠牌、功能不拘

＊請在試卷答案卷（卡）內作答

參考用

1) The inverse Laplace transform of $F(s)=\dfrac{5}{s^3-2s^2+s-2}$ can be denoted as $f(t)=\mathcal{L}^{-1}\{F(s)\}$. Please compute the value of $f(t)$ at the time $t=\pi$. That is to find out the value of $f(\pi)$. (25%)

2) Let $A=(A_{ij})=\begin{pmatrix}-3 & 0 & -1\\ -9 & 1 & 2\\ -9 & 4 & -1\end{pmatrix}$ be a 3×3 matrix. If λ_1, λ_2 and λ_3 are its eigen-values, please find out the sum of these three eigen-values. That is, please compute the value of $\lambda_1+\lambda_2+\lambda_3$. (25%)

3) A particular solution $y(x)$ of the differential equation $x^2\dfrac{d^2y}{dx^2}+x\dfrac{dy}{dx}+9y=x$ satisfies the conditions $y(1)=\dfrac{1}{10}$ and $\dfrac{dy}{dx}(1)=\dfrac{1}{10}$. That is, $y=\dfrac{1}{10}$ and $\dfrac{dy}{dx}=\dfrac{1}{10}$ at the point $x=1$. Please find out the expression of $y(x)$. (25%)

4) There are two points A and B in the plane. The coordinates of A are $(x,y)=(1,\dfrac{-\pi}{2})$ while those of B are $(x,y)=(1,\dfrac{\pi}{2})$. A path Γ connects A and B, and it is described by the equation $x=(\sin y)^2$. Compute the path integral $J=\int_\Gamma P\,dx+Q\,dy$ with $P=\dfrac{1}{x^2y}-\dfrac{y}{x^2}$ and $Q=\dfrac{1}{xy^2}+\dfrac{1}{x}+y$. Note that the integration is carried out along Γ from point A to point B. (25%)