國立中興大學

108 學年度

碩士班考試入學招生

試　　題

學系：土木工程學系丙組

科目名稱：工程數學

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科目：工程數學　　系所：土木工程學系丙組

本科目可以使用計算機　　本科目試題共 1 頁

1. Please find (1) the general solution to $y' + y = x e^{-x}$
   and (2) the solution to $y' + 3y = 4x$, $y(0) = 2$. (20%)

2. Please theory of residues to find the value of $\int_0^\infty [\frac{2x^2 - 3}{x^4 + 5x^2 + 4}] dx$ (20%)

3. Please find the principal stresses σ_1, σ_2, σ_3 and their orientations to a stress state $\sigma_{xx} = 30$, $\sigma_{yy} = 20$, $\sigma_{zz} = 0$, $\sigma_{xy} = \sigma_{yx} = \sigma_{yz} = \sigma_{zy} = 0$, $\sigma_{xz} = \sigma_{zx} = -20$. (20%)

4. Use the Laplace Transformation to solve the integral equation
   $$Y(t) = 2bt + \int_0^t Y(\tau) \sin(t - \tau) d\tau$$ (20%)
   [Hint: $L\{\sin kt\} = k/(s^2 + k^2)$]

5. For an isotropic, homogeneous elastic body in plane strain with no body forces, the stress components σ_{ij} (i,j=x,y) satisfy the following relation
   $$\frac{\partial \sigma_{xx}}{\partial x} + \frac{\partial \sigma_{xy}}{\partial y} = 0$$
   $$\frac{\partial \sigma_{yx}}{\partial x} + \frac{\partial \sigma_{yy}}{\partial y} = 0$$
   $$(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2})(\sigma_{xx} + \sigma_{yy}) = 0$$
   (1) Express the stress components in terms of one stress function Φ and
   (2) show that this stress function is biharmonic. (20%)