八十五學年度國立台灣工業技術學院研究所碩士班招生考試

所別：電子工程技術研究所　　組別：系統組　　科目：工程數學

1.In each of the following problems, find the general solution of the differential equation.

(a)(5%)$y'+y=e^{3x}$

(b)(5%)$y'-xy=x$

2.In each of the following problems, find the general solution of the differential equation.

(a)(5%)$y''-4y=e^{2x}+2x$

(b)(10%)$x^2y''-3xy'+4y=x^6+1$

3.In each case,evaulate f_{xx}, f_{xy}, f_{yy}

(a)(5%)$f=1/(x^2+y^2+1)$

(b)(5%)$f=\tan^{-1}(y/x)$ for $(x,y)\neq(0,0)$

4.Find all critical points of these functions and determine whether they are local maxima,local minima,horizontal inflection, or saddle points.

(a)(5%)$x^2e^{-x}, -\infty<x<\infty$

(b)(10%)$\ln(x^2+y^2+1)$

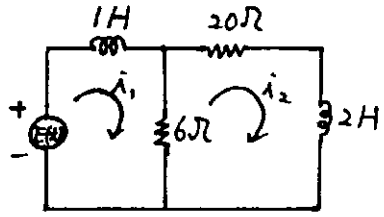
5.Use the Laplace transform to solve the following initial value problem.

(a)(5%)$y''+9y=f(t), y(0)=1, y'(0)=0, f(t)=\begin{cases}0 & \text{if } 0\leq t<4\\ 3 & \text{if } t\geq 4\end{cases}$

(b)(10%)$y''+7y'+6y=f(t), y(0)=0, y'(0)=0, f(t)=\begin{cases}1 & \text{if } 0\leq t<3\\ 0 & \text{if } t\geq 3\end{cases}$

6.(15%)Solve for the currents in the circuit shown in the diagram, assuming that the currents are initially zero and that

$E(t)=\begin{cases}0 & \text{if } 0\leq t<4\\ 2 & \text{if } t\geq 4\end{cases}$



(試)

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7. In the following problems, determine a basis for the subspace S of R^n and determine the dimension of the subspace.

(a)(5%) S consists of all vectors $\langle x,y,y,x+y,z\rangle$ in R^5

(b)(5%) S consists of all vectors $\langle x+z,y+z,-x-z,-y-z,x-y\rangle$ in R^5

8. In the following problems, find an matrix R such that RA=B.

(a)(5%) $A=\begin{bmatrix}-2 & 1 & 4 & 2\\ 0 & 1 & 16 & 3\\ 1 & -2 & 4 & 8\end{bmatrix}$, $B=\begin{bmatrix}-2 & 1 & 4 & 2\\ 2 & -3 & 24 & 19\\ 1 & -2 & 4 & 8\end{bmatrix}$

b.(5%) $A=\begin{bmatrix}-2 & 1 & 4 & 2\\ 0 & 1 & 16 & 3\\ 1 & -2 & 4 & 8\end{bmatrix}$, $B=\begin{bmatrix}-1 & 0 & 24 & 13\\ 0 & 1 & 16 & 3\\ 1 & -2 & 4 & 8\end{bmatrix}$