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大葉大學 98 學年度 研究所碩士班 招生考試試題紙

系所別	組別	考試科目（中文名稱）	考試日期	節次	備註
電機工程學系 碩士班(一般生)	丙組	工程數學(微分方程、Laplace 轉換)	4月12日	第一節	共一頁

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶） 08:30～10:00

✱（只能選擇一考科作答，不可跨考 科作答）

(1).By using of (A) the solution of ODE (ordinal differential equation) method, (B) the Laplace transform, to determine the voltage across the capacitor, $x_c(t)$, for the RC circuit shown in Fig. 1, where the voltage $v(t)=(3/5)e^{-2t}$, $t \geq 0$, is applied, and the initial condition $x_c(0^-)=-2$. (It is known that the behavior of the circuit can be described with the differential equation as $\frac{dx_c(t)}{dt}+\frac{1}{RC}x_c(t)=\frac{1}{RC}v(t)$. **(25%)**

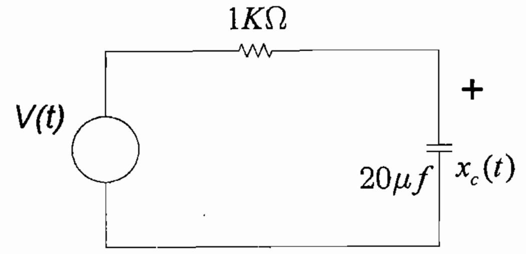

Fig. 1 The circuit of problem (1)

(2).According to the formula of convolution theorem, it is known that $f(t)*g(t)=\sin(t)*\cos(t)=\int_0^t \sin(x)\cdot\cos(t-x)dx=0.5t\cdot\sin(t)$. By using of the Laplace formula for convolution theorem, redo and prove this fact, that is, to prove $L^{-1}\{F(S)\cdot G(S)\}=0.5t\cdot\sin(t)$. **(15%)**

(3).Solve the ODE problems shown below, total solutions of (A) and (B), and special solution of (C). **(30%)**

(A). $y''-2y+y=e^x\sin(x)$, (B). $y'''-y''-8y'+12y=7e^{(2x)}$,

(C). $y''-2y'+10y=0,\ y(0)=4,\ y'(0)=1$.

(4).Find the Laplace or inverse Laplace transform of problems, **(30%)**

(A). $f_A(t)=e^{-t}(t-2)u(t-2)$, (B). $F_B(s)=\ln\left[s(s+1)/(s-2)^2\right]$

(C). $f_C(t)=t\cdot u(t)-(t-1)u(t-1)-(t-2)u(t-2)+(t-3)u(t-3)$

where $u(t)$ denotes the unit step function.