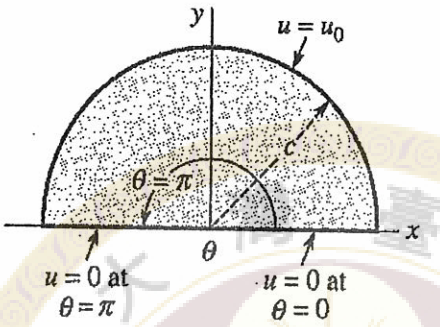
國立臺灣大學101學年度碩士班招生考試試題

(1) (20%) Find the solution of the equation $x(x-1)y''+(3x-1)y'+y=0$

(2) (20%) Find the steady-state temperature distribution $u(r,\theta)$ in the semicircular plate shown in following figure.



(3) (20%) Evaluate $\int_0^{2\pi} \frac{1}{\sqrt{3}-\cos\theta}\,d\theta$

(4) (20%) Find the Fourier integral of Delta function $\delta(t-a)$, and then using the result to evaluate the Fourier transform of $A\cos\lambda t$. a and λ are constants.

[hint: $F(\omega)=\frac{1}{2\pi}\int_{-\infty}^{\infty} f(t)\cdot e^{-i\omega t}dt$, $f(t)=\int_{-\infty}^{\infty} F(\omega)e^{i\omega t}d\omega$]

(5) (10%) Find the least square ("best") solution of the following system:

$$x_1+2x_2=2$$
$$3x_1+2x_2=5$$
$$x_1+3x_2=1$$
$$4x_1+x_2=4$$

(6)(10%)Suppose $f_1(x), f_2(x), f_3(x), \cdots f_n(x)$ possess at least n-1 derivatives. Prove that if the functions $f_1(x), f_2(x), f_3(x), \cdots f_n(x)$ are linearly independent on the defined interval, the Wronskian must not be zero, i.e., $W(f_1, f_2, f_3, \cdots f_n)\neq 0$.

試題隨卷繳回