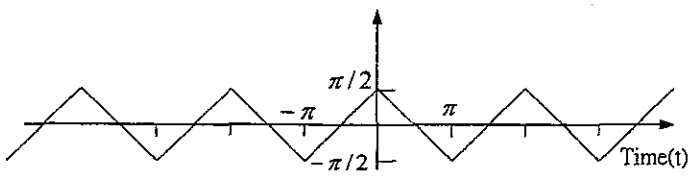
1. Find the solution of the following equation: (15%)
$y''+\lambda y=0,\quad y(0)=y(L),\quad y'(0)=y'(L)$

2. A time signal distribution is shown in the figure. Find the frequencies and the corresponding amplitudes contained in this signal. (15%)

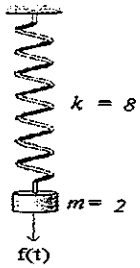


3. (a)Find the solution of the following wave equation (10%)
$$\frac{\partial^2 u}{\partial t^2}=\frac{\partial^2 u}{\partial x^2},\quad -\infty<x<\infty,\quad 0<t<\infty,\quad ICs.\begin{cases}u(x,0)=f(x)\\ u_t(x,0)=g(x)\end{cases}$$
(b)If $f(x)=0,\ g(x)=x,\ 0\le x\le 1$, find the solutions of $u(-\frac{1}{2},\frac{1}{3})$, $u(2,5)$, and $u(\frac{1}{2},\frac{1}{6})$ (5%)

4. Evaluate the line integral of $\oint_C \vec{v}\cdot d\vec{r}$, where $\vec{v}=xz\,\vec{j}$, and C is the trace of surface $z=4-y^2$, cut off by the planes $x=0$, $z=0$ and $y=x$. (15%)

5. Find the principal axes and transform the following equation $2x_1^2+4x_1x_2+5x_2^2=1$ to its canonical form. (10%)

6. Consider a mass and spring vibration system as shown in the figure. The non-dimensional parameters are shown in the figure. Assume that the system is initially at rest. And at time t = 3, a unit impulse force is applied downward on the system suddenly, find the displacement of the system, (10%)



7. Find the principal value of $\int_{-\infty}^{\infty}\frac{1}{(x^2-7x+6)(x^2+4)}dx$ (10%)

8. A body of mass m is thrown vertically into the air with an initial velocity v_0. If the body encounters an air resistance proportional to its velocity, find (a) the velocity of the body at any time t and (b) the time at which the body reaches its maximum height.(10%)

試題隨卷繳回