1. Solve the given initial value problem. (15%)
\[ y'' + y = \delta(t - 2\pi), \quad y(0) = 0, \quad y'(0) = 1 \]

2. If a periodic function \( f(t) \) is shown as follow, find its Laplace transform. (15%)

3. Solve the given equation by Power series method. (20%)
\[ y'' - xy' + 2y = 0 \]

4. (1) What is the Laplace transform \( F(s) \) of the function \( f(t) \) shown in Fig.(a)? (10%)
   (2) Find the limiting value of \( F(s) \) as \( a \) approaches zero. (5%)

Fig. (a) Function \( f(t) \).
5. Find the inverse Laplace transform of

\[ F(s) = \frac{s^4 + 2s^3 + 3s^2 + 4s + 5}{s(s + 1)} \]  \hspace{1cm} (10\%)

6. The equations of motion of the system are

\[ \ddot{u}_1 + 2u_1 - u_2 = 0 \]
\[ \ddot{u}_2 - u_1 + 2u_2 = 0 \]

The following initial conditions are imposed on the system:
\[ u_1(0) = \dot{u}_1(0) = \dot{u}_2(0) = 0 \]
\[ u_2(0) = u_0 \]

Determine the subsequent free vibration motion, \( u_1(t) \) and \( u_2(t) \). \hspace{1cm} (15\%)

7. A parachutist (跳傘者) is falling with speed 176 ft/sec when his parachute (降落傘) opens. If the air resistance is \( Wv^2/256 \) lb, where \( W \) is the total weight of the man and parachute, find his speed \( v \) as a function of the time \( t \) after the parachute opened. \hspace{1cm} (10\%)