LIST OF PRACTICAL IN CLASSICAL DYNAMICS (DSE-I) IN SCILAB.

1) **Damped Harmonic Oscillator.** Plot the solution for a 1-D damped harmonic oscillator vs time. $\boldsymbol{q(t) = Ae^{-\lambda t/2m}\sin(\omega t + \delta)}$**.** Chose suitable constants, i.e. appropriate values for A, λ, m, ω,δ.
2) **Forced Damped Harmonic Oscillator.** Plot A vs ω. A is the amplitude for the solution x(t) of the following differential equation, $\frac{d^2x}{dt^2} + 2\beta\frac{dx}{dt} + \omega_0^2 x = \frac{f_0}{m}\cos\omega t$. Chose suitable β, ω_0, f_0, m; for **A =** $\frac{f_0/m}{\sqrt{(\omega_0^2-\omega^2)^2+4\beta^2\omega^2}}$
3) **Gravity Waves and Ripples**. The speed of such waves is in general given by: $\boldsymbol{c^2 = \left(\frac{g\lambda}{2\pi} + \frac{2\pi T}{\lambda\rho}\right)\tanh\left(\frac{2\pi h}{\lambda}\right)}$**.** For suitable T(tension), ρ (density), and h (depth) plot c vs λ.
4) **Relativistic Doppler Shift.** The relativistic Doppler effect is given by: $\boldsymbol{\frac{\nu'}{\nu} = \gamma(1 - \beta\cos\theta)}$**,** where, $\gamma = \frac{1}{\sqrt{1-\beta^2}}$. For a given θ (say 45^0), plot the fractional shift in frequency vs speed of source, the later given in speed of light unit. i.e. $[\frac{\Delta\nu}{\nu} = \gamma(1 - \beta cos\theta) - 1]\ vs\ \beta$.
5) **Relativistic Mass.** Plot β vs f where f is the fraction by which mass increases with β, from its rest mass value. Plot β for a range of f from 0.01 to 10. This will show the speed needed to increase the relativistic mass by a given fraction between 0.01 (1 percent) and 10 (1000 percent). $\boldsymbol{\beta = \frac{\sqrt{f(2+f)}}{1+f}}$**.**
6) **Life time and Decay length in lab frame.** Let the particle life time be τ in its rest frame and it decays at the point (0, 0, 0) in its rest frame. What's the observed life time & decay length in lab where its moving at speed v? You can boost the particle from its rest frame (CMS) to the lab frame via Lorentz Transformation, in its matrix form. The result is, $\boldsymbol{t = \gamma\tau, x = \beta\gamma c\tau}$**.** Take τ = 10 ns and v = 0.95 c. Find t and x.