CA Part -II, Lab -2

1. Evaluate the following integration using Romberg and Gauss-Legendre rule (see “GL-xi” for roots and weights)

(a) $\int_0^1 e^{-x^2} dx$ (b) $\int_0^{\pi/2} \frac{dx}{\sqrt{1-k\sin^2(x)}}, \quad 0 \le k \le 1$

(i) Tabulate the value of integration with interval number (n) and order (m) using Romberg method. Estimate the least possible value of n and m to achieve an accuracy upto 8 decimal place. Does this depend on value of k? Tabulate the value of integration for 10 values (uniform) of k.

(ii) How many points evaluation in Gauss-Legendre rule are required to reach an accuracy upto 8 decimal place? Does this depend on value of k? Tabulate the value of integration for 10 values (uniform) of k.

(iii) Identify area of physics where you have seen the applications of these integration.

(a) 1.57079 633, Paul L Devries, page 158
(b) 2.8284 (“int-trapezoidal.pdf” page 13, example 4)
(c) 2/3, Look at “integration.pdf” page 34