IMSC. (MATHS & COMPUTING) - VI Sem.(SP/20)
LAB. ASSIGNMENT 5

COMPUTING LAB – MATLAB (**IMM6004**)

Date of Allotment: **30/04/2020**

Write a program on the following and display the output:

1. Explain the working of the following functions:
   (a) int
   (b) odefun
   (c) ode45
   (d) ode15s
2. Using inbuilt function in MATLAB, evaluate the integral
$$\int_0^1 sinx^2 dx$$
and
$$\int_0^\infty e^{-x^2} dx$$
3. Evaluate the integral $\int_0^6 \frac{1}{1+x^2} dx$ using the following rule, taking the number of subintervals $n = 6, 12, 24$ as input from the user.
   (a) Trapezoidal rule
   (b) Simpson's One third rule
   (c) Simpson's Three Eighth rule

   Compare the results with actual value.
4. Using inbuilt function in MATLAB, solve the differential equations:
$$\frac{dx}{dt} = -x + t^2$$
   subject to the condition $x(0) = 1$ integrated from $t = 0$ to $t = 2$. Compare the obtained numerical solution with exact solution.
5. Lotka-Volterra predator prey model in the form of system of differential equations is as follows:
$$\frac{dx}{dt} = \alpha x - \beta xy$$
$$\frac{dy}{dt} = \mu xy - \eta y$$
   where x denotes the number of prey, y refer to the number of predators. α defines the growth rate of prey population, β defines the efficiency rate at which predators find prey and kill them. μ represents the growth rate of predator population due to prey. η is the decay rate of predators. Taking $\alpha = 1$, $\beta = 0.05$, $\mu = 0.02$ and $\eta = 0.5$
   (a) Solve the model system using inbuilt function ode45 with $x(0) = 10$, $y(0) = 10$.
   (b) Plot the solutions as x vs t and y vs t in a single graph.
   (c) Using graphical illustrations, show the change in values of x and y with parameter μ.