DEPARTMENT OF MATHEMATICS

INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

Mid-sem Examination (Lab Component) Odd Semester of 2015-2016

**MA322 & MA311M: SCIENTIFIC COMPUTING**

---

**Instructions:**

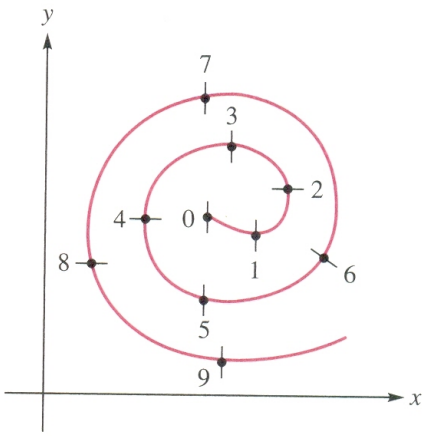
1. There is **only ONE** assignment in parts here.
2. You must e-mail your programme(s) written in in C or C++ to the TA before the deadline of 5 October, 2015. Make sure that your answers are compatible with your programmes.
3. Name your file as youriitgemailid322msm.c or youriitgemailid322msm.cpp. For example, if I were to submit the assignment in C language, I would name the file as jiten322msm.c, not as jiten@iitg.ernet.in322msm.c. Under no circumstances, you are to name your file in any other fashion. Also make sure that you write your name and roll number in your code as comments.
4. The Statements you make use of to solve the problems **MUST** be clearly written.
5. You must return the assignments on the class of 5 October, 2015 along with the print out(s) of your programmes.
6. The front-page of the answer scripts must bear your roll numbers and names along with your **signatures**.

---

In two-dimensions, two cubic spline functions can be used together to form a **parametric representation** of a complicated curve that turns and twists. Select points on the curve and label them $t = 0, 1, 2, ....., n$. For each value of $t$, read-off the $x$- and $y$-coordinates of the point, thus producing a table:

| $t$ | 0 | 1 | ... | $n$ |
|---|---|---|---|---|
| $x$ | $x_0$ | $x_1$ | ... | $x_n$ |
| $y$ | $y_0$ | $y_1$ | ... | $y_n$ |

Then you can fit $x = S(t)$ and $y = \bar{S}(t)$, where $S$ and $\bar{S}$ are natural cubic spline interpolants. $S$ and $\bar{S}$ give a parametric representation of the curve. Now do the following:




1. (a) Draw a spiral like above and reproduce it by way of parametric spline functions. (10).
(b) Using at most 20 knots and cubic splines, plot on a computer plotter an outline of your own **SIGNATURE**. (20).

Give a clear description of how you have accomplished the assignments above. (20).

**NOTE:** You may use software package like **windig** in order to extract the coordinates of the points chosen by you from your signature.

## HAPPY COMPUTING.