Introduction to Spatial Computing- CSE 5ISC
## Homework 1
## Due date: August 28, 2015 2:00pm

Instructions:

- All submissions must be made through usebackpack site for this course (www.usebackpack.com/iiitd/m2015/cse5isc/info)
- Only one submission per team would be considered and graded. It would be assumed that all members of the team participated equally and same score would be given to all members of the team.
- Any assumptions made while solving the problem should be clearly stated in the solution.

Question 1 (20 points): Consider the planar configuration of nodes, directed arcs and areas given below. Answer the questions A-F with respect to this figure. Please justify your answers briefly.

Figure for Question 1
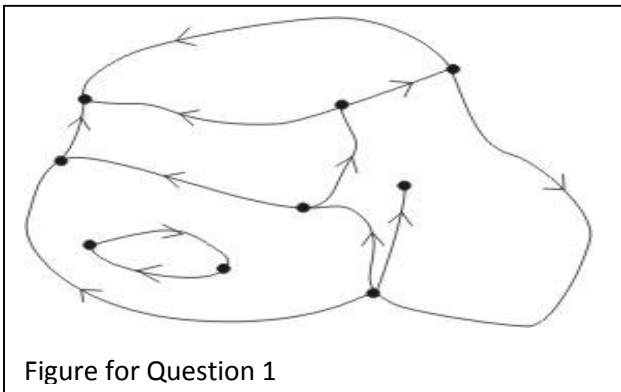
(a) What is the maximum number of directed arcs associated with an area?

(b) What is the minimum number of directed arcs associated with an area?

(c) What is the maximum number of left-bounding area for a given arc?

(d) What is the minimum number of left bounding area for a given arc?

(e) What is the maximum number of nodes for a given area?

(f) What is the minimum number of nodes for a given area?

Question 2 (20 points): Answer the questions (a) through (f) from Question 1 in the context EER diagram shown below. Here the answers are restricted to 0, 1 or many followed by a very brief justification of the answer. Does this EER diagram also violate any of your knowledge of geometry? Explain the surprises in terms of the purpose of conceptual data model such as EER. Suggest ways to improve EER diagram to address the surprises. Limit your narrative to 100 words.

Figure for Question 2.
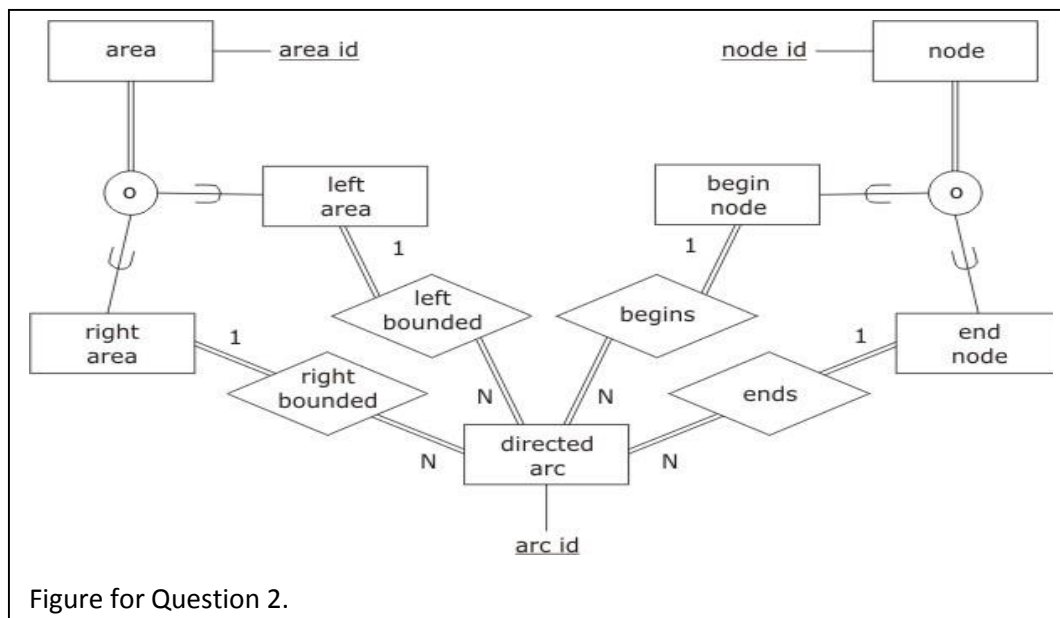
Question 3 (20 points): Recall the properties of topological spaces and definition of neighborhood in point set topology. Which of the following collection of sets satisfy these properties. Each member set is a collection of points within fixed value of a function, defined in one of the following ways. Justify your answer.

    (a) Euclidean (straight-line) distance on a place
    (b) Total travel-time experienced in a transportation network via driving, public transportation and walking.

Question 4 (40 points) (Programming assignment on Geo-coding): For this question you are expected to use the Google Maps Javascript API. Please browse through their help site (https://developers.google.com/maps/documentation/javascript/examples/) and guide https://developers.google.com/maps/documentation/javascript/tutorial to familiarize yourself. After that, following tasks are to be performed.

    (a) Select any two stations from the Delhi Metrorail map (http://www.delhimetrorail.com/Zoom_Map.aspx) which are reasonably far apart (about 5-6 stations or more). Write a javascript+html code to visualize the route taken by delhi metro using the polyline API of google (https://developers.google.com/maps/documentation/javascript/examples/polyline-simple). Note that for this you would need get the latitude and longitudes of intermediate stations. You can do so using a combination of marker API (https://developers.google.com/maps/documentation/javascript/examples/marker-simple) and click events (http://stackoverflow.com/questions/6374329/get-latitude-and-longitude-of-marker-onclick).

    (b) Review the directions API of Google Maps Javascript API (https://developers.google.com/maps/documentation/javascript/directions?hl=en). Write a javascript+html code to visualize the driving route returned by google maps between the two metro stations selected in part (a) for three different departure times of the day. Possible one each in morning, afternoon and evening. You would have to set the depature_time parameter in this API.

Things to be submitted:

 A zipped folder containing the following items. Please include your team information with the submission.

    (a) A pdf file containing the solution of Question 1, Question 2 and Question 3
    (b) Javascript+html code for both the parts in Question 4.
    (c) Screen shots of output for Question 4.