

## Assyout University

Faculty of Computers & Information  
Information Systems Department

Examiner: Dr. M. Nour ElDien

Answer all questions

## 2011 Final Exam.

Subject Name: Geographic Information System

Semester: Second

Date: June 15, 2011

Duration: 3 hours

### Question 1(12 marks)

- (i) Consider an image which is a map of Egypt such that places appear on the map at the pixel coordinates given in the table below. Build a 2d-tree to store the data expressed in the table. You should insert items in the order in which they appear in the table. (6Marks)
- (ii) Perform a radius search on your tree with point (25, 20) and radius 50 which place(s) is / are returned? Explain your working. (6Marks)

Place	XVAL	YVAL
Cairo	21	80
PortSaid	25	99
Giza	17	70
Fayoum	15	50
Alwady Elgdid	12	30
Aswan	16	5
Alex.	19	99
North Sinai	33	98
Matrouh	14	75

The  $X_{LB}$ ,  $X_{UB}$ ,  $Y_{LB}$ , and  $Y_{UB}$  of the image is 0,100,0,100

### Question 2(14 marks)

2.1. Write in pseudocode an algorithm to execute range queries on R-trees. Your algorithm called Rtree, takes the following inputs:

1. A pointer T to the root of an R-tree
2. An Integer x denoting an x-coordinates
3. An Integer y denoting an y-coordinates
4. A Distance  $r > 0$

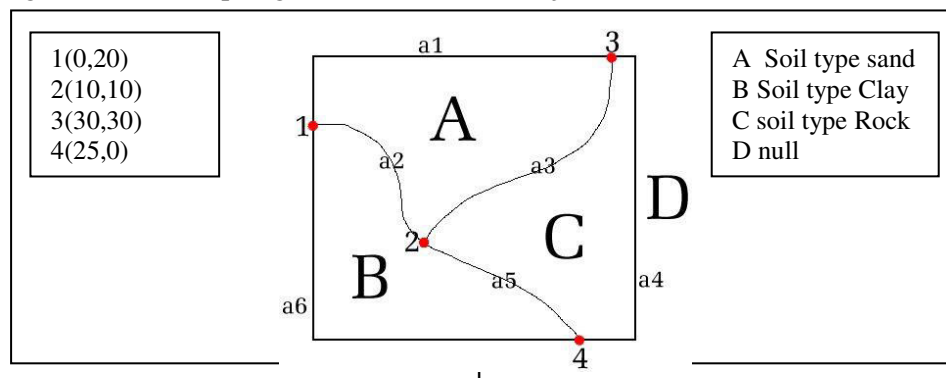
Your algorithm must print out the names of all rectangles in the R Tree Pointed to by T that are entirely contained within the circle of radius r centered at (x,y) and have a nonempty intersection with the circle of radius r centered at (x,y) (8Marks)

2.2. Write in pseudocode an algorithm to calculate the number of CONTIGUOUS PATCH and the AREA OF each CONTIGUOUS PATCH using Quadtree (6Marks)

### Question 3(24 marks)

3.1. Represent the following figure in geo-database taking into consideration:

The geometric and topologic characteristics of object (4 Marks)



3.2. Explain the main difference between: (10 Marks)

- G.I.S. And CAD System
- Spaghetti and topological model
- Vector and Raster Map
- Point, node and vertices
- Topographic and thematic map

3.3 Give an example and explain the difference on map and on attribute table by using the following spatial operations in case of point, line, and polygon (10 Marks)

- Buffer
- Intersection
- Union
- Merge
- Dissolve

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### **Question 4(10 marks)**

4.1. Explain how to calculate the Morton position of the cell (row 3 column 4)? And How to find row and column number from Morton position 13?

4.2. Explain how to calculate the different adjacent of cell 113?

4.3. The following figure shows the land use of an area

1. Store this map using THE QUADTREE
2. Using Quadtree, explain how to calculate the area of the lake
3. Encode this figure twice, first using row prim order and second by Morton order

