BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI – 333 031

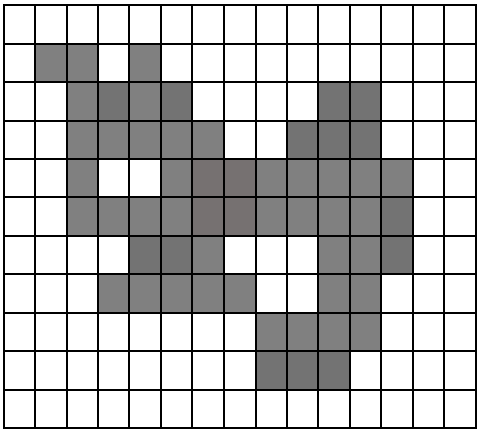
First Semester, 2016–2017, Comprehensive Examination

Course No. & Title: **CE F431 Prin. of Geo Info Sys**

Date & Time: **Dec. 12, 2016 (900 Hrs to 1200 Hrs)**

Weight & Nature: **Max. 120**

Q.1. Apply the thinning algorithm for the given raster image and get the final output? Show all the steps to convert it into a vector image. Also write the run-length coding.



(15)

Q2. Use Douglas-Peucker algorithm to discretize (till 4 steps) the curve $y = 2x^2 + 4x + 6$ where x in [0, 4], using a graph paper and a ruler. What should be the steps to be followed if we want to discretize the curve analytically without using graph paper and ruler?

(10)

Q3. Transform the object ABCD [(1,0), (5,1), (5, 4), (2,10)] from coordinate scale A to coordinate scale B. Assume the followings: X_A: X_B =1:5; Y_A:Y_B =1:2. X-axis of scale A makes an angle of 45° in anti-clockwise direction with X axis of scale B. Write the transformation matrix for each operation and for complete operation.

(10)

Q.4 Calculate the least cost path between nodes A and B for making a canal. Consider min. two physical factors: type of soil (Fig.1), right of way (Fig. 2) and one environmental impact (vegetation and wild life) (Fig.3). Assume the size of pixel 100x100m. Total cost is estimated as $c = c_1 + 2c_2 + c_3^{1.5}$

2	3	5	1	6
5	8	6	3	2
7	6	8	3	5
9	5	2	7	6
7	6	9	3	5

Fig. 1 (c_1)

1	3	2	2	1
1	2	1	3	2
2	3	1	2	1
1	1	1	2	2
2	3	1	1	3

Fig. 2 (c_2)

2	3	2	4	1
1	2	3	2	1
3	2	1	2	3
2	4	2	1	3
1	2	1	2	1

Fig. 3 (c_3)

(20)

Q.4. Consider three rainfall stations with known values around point 'o (3, 3)' with an unknown rainfall value. The table below shows the x, y coordinates of the points, measured in row and column of a grid with the cell size 1000m and the known values (annual rainfall in ft.)

Point	x-coordinate	y-coordinate	Annual rainfall (ft)
1	2	2	3
2	3	7	4
3	9	9	2

Interpolate the rainfall at point zero, using:

(a) Inverse distance weighted
(b) Thin plate spines with tension, and
(c) Kriging; assume exponential model with $c_0 = 2.5$, $c_1 = 7.5$, and a =10

(5+ 8+10)

Q.5 Latitude and longitudes of different cities are given in tabular form. The last column shows the connectivity (to and fro) of the city to other cities by air. Which air-route you will follow to go from city Chennai to Leh. What are the data you need to store and how will you store them. Apply dijakstra's algorithm (marks will be awrded for correct methodology only and not the answer).

City	**Latitude**	**Longitude**	**Connectivity (Both ways)**
Jaipur (J)	26°55'N	75°49'E	D, C,
Delhi (D)	28°36'N	77°12'E	ALL
Agra (A)	27°11'N	78°01'E	C, Ln, Jm
Cheenai (C)	13.07983° N	80.27008° E	D,
Lucknow(Ln)	26°57'N	80°55'E	C
Jammu (Jm)	32°44'N	74°52'E	S, L
Srinagar (S)	34°05'N	74°49'E	
Leh (L)	34°10'N	77°35'E	S

(20)

Q.6. Given the following confusion matrix:

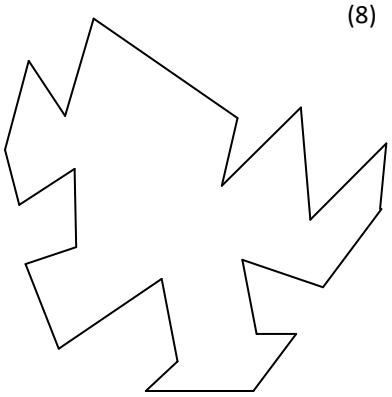
Category	A	B	C
A	120	12	8
B	21	212	9
C	16	11	89

Estimate the following quantities:

a) The overall accuracy of the classification outcome
b) The producer's accuracy for the three classes
c) The user's accuracy for the three classes (8)

Q.7 Apply the Garey et al. Triangulation method on the given polygon and provide the triangulated output. (Apply regularization on whole polygon and triangulation only on the largest polygon formed after regularization). Use graph paper. Show all the steps

(15)



Q.8 Write short note on Map projection and give examples indicating the reduction in error by using suitable map projection.

(10)

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Q.3