

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering 4th Year 2nd Term Examination, 2016
 Department of Computer Science and Engineering
 CSE 4207
 Computer Graphics

TIME: 3 hours

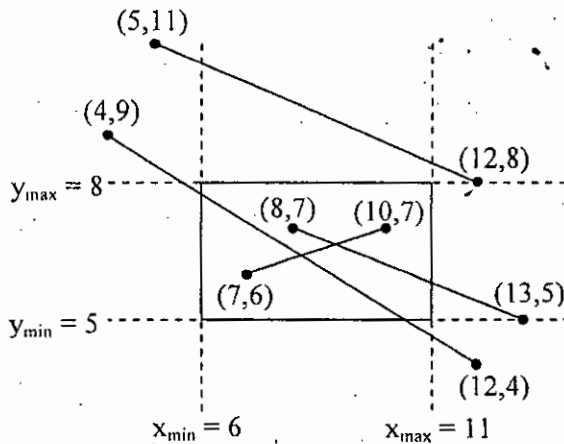
FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
 ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) What does computer graphics deal with? We have cameras to shoot photographs or videos, (07) then what are the driving factors of computer graphics?
 - b) Let a unit square defined by $0 \leq x \leq 1$, and $0 \leq y \leq 1$ in object coordinate system. New (13) positions X' are derived from the local positions X by $X' = MX$, where M is a transformation matrix. Give a matrix M , expressed in terms of basic modeling transformations, to obtain a rectangle with width = 2 and height = 3, centered around the origin of world coordinate system, and rotated over an angle of 30° .
 - c) Why are matrix representations used to describe point transformations in computer graphics? (10) Derive the basic rotation matrix for a rotational transformation about z-axis.
 - d) Explain the properties of rigid body transformation and affine transformation. (05)
2. a) Find the mirror reflection of the point (3, 1, 6) with respect to the plane defined by the points (14) (0, 1, 0), (0, 0, 1), and (1, 0, 0).
 - b) Explain the working principle of 2D Sutherland-Hodgeman polygon clipping algorithm with (13) necessary illustrations and equations. How can it be extended to 3D?
 - c) Briefly explain the taxonomy of planar geometric projection. (08)
3. a) Let the view coordinate system (VCS) is defined by the parameter *eye* $(0, 0, 1)_{WC}$, *look-at* (14) $(0, 0, 0)_{WC}$, *head-up* $\vec{V} = j$. If the projection plane is parallel to the xy plane of the VCS and cuts the negative z -axis of VCS at a distance $d = 1$, find the perspective projection of the point $(1, 1, -1)_{WC}$ on the projection plane considering the VCS origin as a center of projection. (14)
 - b) Use Liang-Barsky line clipping algorithm to clip the lines in the following figure. (14)



- c) Briefly explain principal vanishing points for standard perspective projection. Use necessary (07) diagram.
4. a) Let a triangular facet, tessellated part of a large curved surface, is defined by the vertices (15) A (1, 4, 0), B (5, 6, 0), C (4, 0, 0) and their vertex normal are $N_A = -i + j + 3k$, $N_B = j + 3k$, $N_C = i + 4k$ respectively. If the triangle is illuminated by a monochromatic point light source positioned at $(-2, 3, 2)$, and the diffuse reflectivity of the surface is 0.7 then find the diffuse reflection intensity of point P (3, 3, 0) that a viewer will see from position (6, 3, 1). Assume any missing values (if necessary).
 - b) Compare among flat shading, Gouraud shading, and Phong shading techniques. (09)
 - c) Show that the path of a refracted ray is $t = z - \left(\sqrt{1 - |z|^2} \right) n$, where $z = \frac{\eta_1}{\eta_2} (u - (u \cdot n))n$, u is (07) incoming ray, n is surface normal, and η_1, η_2 are the refractive indices of the media.
 - d) What are the trade-offs of ray tracing method? (04)

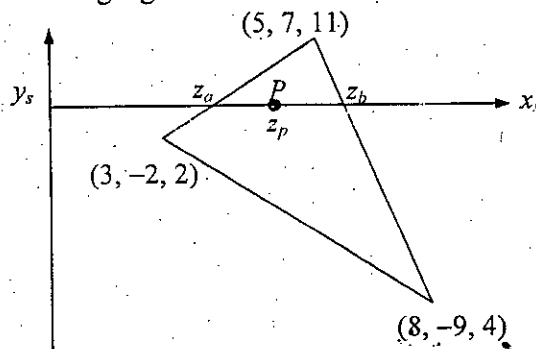
SECTION B

(Answer ANY THREE questions from this section in Script B)

5. a) Indicate which raster locations would be chosen by Bresenham's algorithm when scan- (12)
converting a line from pixel coordinate (1, 1) to pixel coordinate (8, 5).
b) What are the major side effects of scan conversion? (08)
c) Using midpoint algorithm, draw an ellipse with center (2, 2), major axis = 12, and minor (15)
axis = 10.

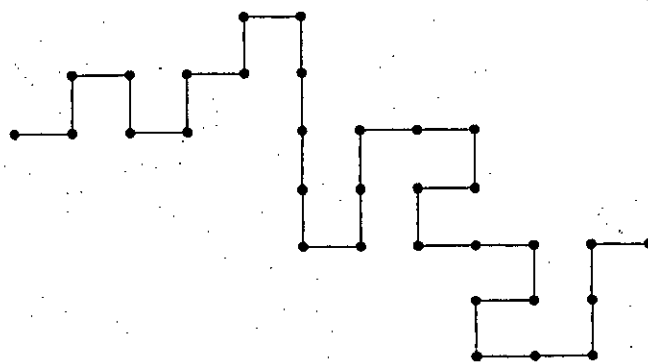
6. a) How do you convert RGB color space into HSI color space? Explain briefly with appropriate (12)
figure.
b) What are the possible representations of a curve? Why is the parametric curve of degree 3 (10)
(cubic) preferable?
c) Define chromatic light and achromatic light. What are the properties of chromatic light? (07)
Explain briefly.
d) What is a raster display? Explain the necessity of scan conversion. (06)

7. a) Define fractal. Generate a fractal image using the following language (12)
AA[A[B]AA(B)]AAAA(A[B]AA(B))
where Alphabet {A, B, [,], (,)}
Rule A ⇒ AA
 B ⇒ A[B]AA(B)
 [] ⇒ left branch
 () ⇒ right branch
b) What are the difficulties encountered in implementing the painter's algorithm? When does (08)
z-fighting problem arise?
c) How does the z-buffer algorithm determine which surfaces are hidden and hence compute the (10)
z-value at point P of the following figure.



- d) How can you generate the terrain in computer graphics? Explain. (05)

8. a) What do you know about geometric continuity and parametric continuity? Explain G^0 , G^1 , (10)
and G^2 geometric continuity.
b) Define Hermite surface. Find the geometry vector G_{H_x} for Hermite surface. Also find twist (11)
of the vector.
c) Derive the equation for calculating fractal dimension and hence find the dimension of the (07)
following fractals.



- d) What is texturing? Compare between bump mapping and frame mapping techniques. (07)

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering 4th Year 2nd Term Examination, 2016
Department of Computer Science and Engineering
CSE 4239
Data Mining

TIME: 3 hours

FULL MARKS: 210

- N.B. i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION A

(Answer **ANY THREE** questions from this section in Script A)

1. a) Define data mining as a process of knowledge discovery. Why is data mining confluence of multiple disciplines? (07)
b) "Measuring the quality of data is a multidimensional view" – explain in your own words. (06)
c) Consider the following data for analysis: (15)
13, 15, 16, 16, 19, 20, 21, 22, 22, 25, 30, 30, 33, 35, 35, 40, 45, 46, 52, 70.
i) Using smoothing by bean means, smooth the above data using bean depth 3. How much effective is this technique for the given data?
ii) Use min max normalization to transform the value 46 into the range [0-1].
iii) Use z score normalization to transform the value 40 ($stdv = 12.9$).
d) "Tuples with missing value is a common occurrence" – how can you handle the missing value problem? (07)
2. a) Define data warehouse. Make a comparison between data warehouse and database. (07)
b) When do you use snowflake schema over star schema? And why? (08)
c) Suppose that a data warehouse consists of the four dimensions: date, spectator, location, game; and two measures: count and charge; where charge is the fare that a spectator pays when watching a game. Now perform the following (12)
i) Draw a star schema diagram for the data warehouse.
ii) Starting with the base cuboid [date, spectator, location, game], what specific OLAP operations should you perform to list the total charge paid by spectators at GM-place in 2010?
d) Explain bit map indexing with your own example. Why is bit map indexing efficient for data warehousing? (08)
3. a) How can you explain the idea of clustering as a means of (12)
i) Classification
ii) Data reduction
iii) Finding k -nearest neighbor
b) Differentiate between agglomerative and divisive method of clustering. Explain the idea of BIRCH clustering method. (15)
c) Illustrate the strengths and weakness of k -means and k -mediod algorithms. (08)
4. a) Define outlier as a data mining problem. Give a classification of outliers. (07)
b) How do you differentiate between outlier and noise? Explain. (05)
c) Define parametric method of outlier detection. How can you detect univariate outlier for normal distributed data? Find outlier form the following data (if any) (13)
40.0, 48.9, 48.9, 49.0, 49.1, 49.1, 49.2, 49.4, 49.3, 49.6
d) What is Cluster Based Local Outlier Factor (CBLOF)? How can you use CBLOF to detect outliers? Explain. (10)

SECTION B

(Answer **ANY THREE** questions from this section in Script B)

5. a) Differentiate between symmetric and asymmetric binary attribute. How can we determine the proximity measure of these attributes? Explain. (10)

- b) Suppose we have a 2-D data set mentioned in the following table. Given a new data point, $x = (1.4, 1.6)$ as a query, rank the database points based on similarity with the query using the following:
- Euclidean distance
 - Manhattan distance
 - Cosine similarity

	A ₁	A ₂
x ₁	1.5	1.7
x ₂	2.0	1.9
x ₃	1.6	1.8
x ₄	1.2	1.5
x ₅	1.5	1.0

- c) What is five number summary? How can you visualize a distribution by BoxPlots? (10)
6. a) Briefly explain Hashing based approach to improve Apriori principle. (07)
- b) "An FP tree registers compressed, frequent pattern information" – justify the statement. (10)
- c) Consider the following contingency table that summarizes supermarket transaction data. (10)

	hot dogs	hot dogs	Σ_{row}
hamburgers	2000	500	2500
hamburgers	1000	1500	2500
Σ_{column}	3000	2000	5000

- Suppose that the association rule "hot dogs \Rightarrow hamburgers" is mined. Given a minimum support threshold of 25% and a minimum confidence threshold of 50%, is this association rule strong? Why?
 - Based on the given data, is the purchase of 'hot dogs' independent of the purchase of 'hamburgers'? If not, what kind of correlation relationship exists between the two?
- d) Association rule mining often generates large number of rules. How can you reduce number of rules generated preserving interesting rules? (08)
7. a) Why is tree pruning useful in decision tree induction? What is the drawback of using separate set of tuples to evaluate pruning? What is the cure? (12)
- b) Give a comparison among the attribute selection measures of information gain, gain ratio and gini index. (07)
- c) What is class imbalance problem? How will you evaluate the performance of a classifier having class imbalance problem? (08)
- d) Compare the advantages and disadvantages of eager classification versus lazy classification. (08)
8. a) Consider the table mentioned below, taken from an employee database. Now determine the 'status' of the tuple (*marketing*, 31...35, 46K...50K) using Naïve Bayesian classification, where 'status' attribute represents the class label. (15)

Department	Status	Age (years)	Salary (pounds)
sales	senior	31...35	46K...50K
sales	junior	26...30	26K...30K
sales	junior	31...35	31K...35K
systems	junior	21...25	46K...50K
systems	senior	31...35	66K...70K
systems	junior	26...30	46K...50K
systems	senior	41...45	66K...70K
marketing	senior	36...40	46K...50K
marketing	junior	31...35	41K...45K
secretary	senior	46...50	36K...40K
secretary	junior	26...30	26K...30K

- b) "Support vector machine is a method of classification for both linear and nonlinear data" – explain the idea. (10)
- c) Define classification accuracy. How does k -fold cross validation estimate classification accuracy? Explain. (10)