2021

COMPUTER SCIENCE — GENERAL

Paper : DSE-A-1

(Database Management System)

Full Marks : 50

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Answer **question no. 1** and **any four** questions from the rest.

1. Answer **any five** questions of the following :   2×5

   (a) Define domain of a relation.

   (b) What is the function of referential integrity?

   (c) Define superkey with example.

   (d) What do you mean by prime attribute of a relation schema?

   (e) Define lossless decomposition.

   (f) What is meant by specialization?

   (g) Explain intersection operation with an example.

   (h) Write any 2 command names for DDL and DML both.

2. (a) Explain the three schema architecture.

   (b) Write the differences between file processing system and database management system.

   (c) Define schema.   5+4+1

3. (a) What are represented by a double rectangle and ellipses in a E-R diagram?

   (b) Differentiate between superkey and candidate key with example.

   (c) Consider a database used to record the marks that students get in different exams of different course offerings. Construct an E-R diagram that models exams as entities, and uses a ternary relationship, for the above database.   2+3+5

4. (a) Explain Cartisian product and projection with example.

   (b) Write short note on equi-join and natural join.   (2½+2½)+ (2½+2½)

Please Turn Over

5. (a) Differentiate between 'having' and 'where' clause with suitable example.

   (b) Why are duplicate tuples not allowed in a relation?

   (c) Why SQL is called a relationally complete language? (2+2)+3+3

6. (a) What is metadata?

   (b) Explain many to many and one to many relationship with example.

   (c) What is a weak entity type? How this is denoted in ER diagram? How the entities are identified?
   1+4+5

7. (a) Briefly describe 3NF with an example.

   (b) How is BCNF stronger than 3NF?

   (c) Normalise the following relation to 1NF :

   Project

P-ID	P-Name	Cities
P001	A	{XX, YY, ZZ}
P015	B	{XX, ZZ}
P107	C	{YY}

   3+2+5

8. (a) Write the difference between delete and truncate command.

   (b) Briefly explain the role of DBA.

   (c) What is data dictionary?

   (d) Give examples for single valued and multivalued entity. 2+3+3+2

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COMPUTER SCIENCE — GENERAL

Paper : DSE-A-2

(Operation Research)

Full Marks : 50

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Candidates are required to give their answers in their own words
as far as practicable.

Answer *question no.* **1** in **Section - I** and *any four* from **Section - II**.

Section – I

1. Answer *any five* questions :   2×5

    (a) What is Slack-variable?

    (b) What is Surplus-variable?

    (c) What are the conditions of having feasible solutions of set of linear equations?

    (d) What do you mean by Basic Feasible Solution of equations?

    (e) Define degeneracy in LP-Problems.

    (f) Distinguish between separable programming and non-separable programming.

    (g) Write short note on Buffer Stock.

    (h) What do you mean by Optimal run time of a LPP?

    (i) Define unbalanced transportation problem.

    (j) State Bellman's Principle of Optimality.

Section – II

2. Find the initial Basic Feasible solution of the following transportation problem by VAM method.   10

Factroy	Warehouses				Available
	W1	W2	W3	W4	
F1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
Requirement	5	8	7	14	34

Please Turn Over

3. A toy manufacturer uses 48,000 rubber wheels per year for its popular dump truck series. The firm makes its own wheels, which it can produce at a rate of 800 per day. The toy trucks are assembled uniformly over the entire year. Carrying cost is 10 per wheel a year. Set up cost for a production run of wheels in 450. The firm operates 240 days per year. 10

   Determine each of the following :

   (a) Optimal run size

   (b) Minimum total annual cost for carrying and set up

   (c) Cycle time for the optimal run size

   (d) Run time.

4. A manufacturer of toys makes two types of toys, A and B. Processing of these two toys is done on two machines X and Y. The toy A requires two hours on machine X and six hours on machine Y. Toy B requires four hours on machine X and five hours on machine Y. There are sixteen hours of time per day available on machine X and thirty hours on machine Y. The profit obtained on both the toys is the same, i.e., 5 per toy. Formulate this problem as an integer LP problem. 10

5. Solve the following problem by Simplex method. 10

   $$\text{Maximized } Z = 10x_1 - 4x_2$$

   Subject to :

   $$2x_1 - 6x_2 \leq 0$$
   $$-x_1 + 2x_2 \geq -2$$
   $$-3x_1 - 3x_2 \geq 24$$
   $$x_1, x_2 \geq 0$$

6. Find the optimum strategies for A and B and the value of the game. 10

	B			
	1	7	2	4
A	0	3	7	8
	5	2	6	10

7. Suggest optimum assignment of 4 workers A, B, C and D to 4 jobs I, II, III and IV. The time taken (hours) by different workers in completing the different jobs is given below : 10

		JOBS			
		I	II	III	IV
Works	A	8	10	12	16
	B	11	11	15	8
	C	9	6	5	14
	D	15	14	9	7

8. Write short notes on *any two* of the the following : 5×2

    (a) Saddle Point in Game Theory

    (b) Sensitivity analysis in LP Problems

    (c) Non-linear Programming

    (d) Branch and Bound Approach.

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2021

COMPUTER SCIENCE — GENERAL

Paper : DSE-A-3

(Computer Graphics)

Full Marks : 50

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as far as practicable.*

Answer **question no. 1** and **any four** questions from the rest.

1. Answer **any five** questions : 2×5
   (a) Define Raster scan.
   (b) Mention properties of pixel.
   (c) Differentiate between monochrome and color monitor.
   (d) How shearing effect transformation of an object in 2D?
   (e) What do you mean by line drawing in graphics?
   (f) Write 2D reflection matrix about x-axis and y-axis.
   (g) Define computer animation.
   (h) Define clipping operation in Computer Graphics.

2. (a) Mention features of a CRT monitor.
   (b) Why translation matrix in 2D needs to be converted in homogeneous form? Explain in details.
   (c) What do you mean by scaling? Explain its types. 3+4+3

3. (a) Briefly explain the steps required for designing an animation sequence.
   (b) Define projection. Mention its application.
   (c) What do you mean by inverse transformation? 5+3+2

4. (a) Discuss commutative property of rotation and scaling in 2D.
   (b) Discuss about different types of parallel projections. 5+5

5. (a) Rotate a triangle with vertices (10, 20), (10, 10) and (20, 10) about the origin by 60°. Find the new co-ordinates of the triangle.
   (b) Show that the multiplication of transformation matrices for two successive scaling is commutative. 5+5

Please Turn Over

6. (a) Explain the working principle of DDA line drawing algorithm.

   (b) Using DDA, find plotted pixels of straight line A(1, 2), B(4, 9).   5+5

7. (a) Discuss Cohen-Sutherland line clipping algorithm.

   (b) Apply Cohen-Sutherland line clipping algorithm to clip the line segment with co-ordinates (70, 20) and (100, 10) against the window (50, 10), (80, 10), (50, 40) and (80, 40).   5+5

8. (a) Why Bresenham's mid point line drawing algorithm is more efficient than DDA algorithm?

   (b) Why is it sufficient to determine pixels of only one octant of circle in circle drawing algorithms? Explain clearly.

   (c) Define refresh rate of a display device.   4+4+2

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