

SE (CMTI) SEM IV

CG

16/6/2014

(CBQS)

QP Code : **NP-19874**

(3 Hours)

[Total Marks : 80

- N. B. : (1) Question No. 1 is **compulsory**.
(2) Solve any **three** questions from the remaining.
(3) Assume any suitable data.

1. (a) Explain Bresenham's line drawing algorithm. Plot a line by using Bresenham's line generating algorithm from (1,1) to (5,3) **10**
(b) Define window, view port and derive window to view port transformation **10**
2. (a) Explain parallel and perspective projections and derive the matrix for perspective projection. **10**
(b) Specify mid point circle algorithm. Using the same, plot the circle whose radius is 10 units **10**
3. (a) Explain Gouraud and Phong shading along with their advantages and disadvantages **10**
(b) Explain scan line fill algorithm with an example **10**
4. (a) Explain Liang Barsky line clipping algorithm. Apply this algorithm to the line with coordinates (30,60) and (60,25) against the window
(X min, Y min) = (10,10) and (X max, Y max) = (50,50) **10**
(b) Explain any one polygon clipping algorithm **10**
5. (a) Derive the matrix for 2D rotation about an arbitrary point. **10**
(b) Explain Bezier curve and also specify the properties of Bezier curve. **10**
6. Write a short note on any **two** :- **20**
 - (a) Half toning and dithering techniques
 - (b) Raster techniques
 - (c) Describe the following 3-D representation methods:-
 - (i) Sweep representation
 - (ii) B-REP
 - (iii) CSG

TCS

QP Code : NP-19836

(3 Hours)

[Total Marks : 80]

N.B. : (1) Questions No.1 is compulsory.

(2) Attempt any **three** questions out of remaining **five** questions.(3) Assumptions made should be **clearly** stated.(4) **Figures** to the **right** indicate **full** marks(5) Assume **suitable** data wherever **required** but **justify** the same.

1. (a) Differentiate between NFA and DFA. 5
- (b) Explain CNF and GNF with example. 5
- (c) State and prove closure properties of Context Free Languages. 5
- (d) Give Applications of Regular Expression and Finite Automata. 5

2. (a) Construct an NFA with epsilon transition for following RE. 5
 $(00 + 11)^*(10)^*$
- (b) Give formal definition of Regular expression. Give R.E. for following :— 5
 - (i) Set of all strings over $\{1, 0\}$ that end with 1 and has no substring 00.
 - (ii) Set of all strings over $\{1, 0\}$ with even number of 1's followed by odd number of 0's.
- (c) Compare and Contrast Moore and Mealy Machine. Construct Moore Machine 10
to find out the residue-modulo-3 for binary numbers.

3. (a) Consider the following grammar :— 10

$$S \rightarrow i C t S \mid i C t S \epsilon S \mid a$$

$$C \rightarrow b$$
 For the String 'ibtibtaea' find the following :
 - (i) Leftmost derivation
 - (ii) Rightmost derivation
 - (iii) Parse Tree
 - (iv) Check if the above grammar is Ambiguous
- (b) Design PDA that checks for well- formed parentheses. 10

4. (a) Design a TM that recognizes palindrome strings where $\Sigma = \{0, 1\}$ 10
- (b) Construct NFA that accepts a set of all strings over $\{a, b\}$ ending with "abb" Convert this NFA to Equivalent DFA. 10

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5. (a) Convert the following Grammar to CNF form :— 10
- $S \rightarrow ABA$
 $A \rightarrow aA \mid bA \mid \epsilon$
 $B \rightarrow bB \mid aA \mid \epsilon$
- (b) Give and explain the formal statement of Pumping Lemma for regular languages and use it to prove that the following language is not regular : 10
- $L = \{ a^n b^n \mid n \geq 1 \}$
6. Write short note on :— 20
- (a) Chomsky Hierarchy of Grammar
 - (b) Variants of Turing Machine
 - (c) Rice's Theorem
 - (d) Recursive and Recursively enumerable languages.

QP Code : NP-19797

(3 Hours)

[Total Marks : 80

- N.B. :** (1) Question No. 1 is compulsory.
(2) Solve any **three** questions from the **remaining** questions.
(3) Make **suitable** assumptions if **needed**.

1. (a) List four significant differences between file processing system and database management system. 5
(b) Explain shadow page recovery. 5
(c) Explain the terms 'total participation' and 'partial participation' with example. 5
(d) Explain lossless join decomposition and dependency preserving decomposition. 5
2. (a) Explain conflict serializability and view serializability with examples. 10
(b) Construct an ER diagram and relational model for hospital with a set of patients and a set of medical doctors. Patients are treated in a single ward by the doctors assigned to them. Each patient will be treated by a single doctor. Healthcare assistants also attend to the patients, a number of these are associated with each ward. Patient undergoes various tests. Accounts department manages patient treatment bill and staff payment. Some staff are paid part time and doctors and care assistants work varying amounts of overtime at varying rates (subject to grade). 10
3. (a) What is an attribute? Explain different types of attributes with examples. 10
(b) Write SQL queries for the given database. 10
Sailor(sid, sname, rating, age)
Boat(bid, bname, color)
Reserves(sid, bid, date)
 - (i) Find the names of sailors who have reserved 'red' boat.
 - (ii) Find the sailor (name) with highest rating.
 - (iii) Find the average age of sailor.
 - (iv) Find the age of youngest sailor for each rating level.
 - (v) Add the new boat to the database. Assume any values for required attributes.
4. (a) Explain the term super key, primary key, candidate key and foreign key giving suitable examples. 10
(b) What is normalization? Explain 1NF, 2NF, 3NF, BCNF with suitable examples. 10
5. (a) Explain domain constraints and referential integrity constraints. 10
(b) Explain sort-merge join algorithm in query processing. 10
6. (a) Explain following relational algebra operations with examples :— 10
 - (i) set intersection.
 - (ii) Generalized projection
 - (iii) Natural Join
 - (iv) Division operator
(b) Describe the overall architecture of DBMS with suitable diagram 10

SE - COMP - CBAS
Sem IV - Analysis of Algorithms
Dt: - 23/5/14

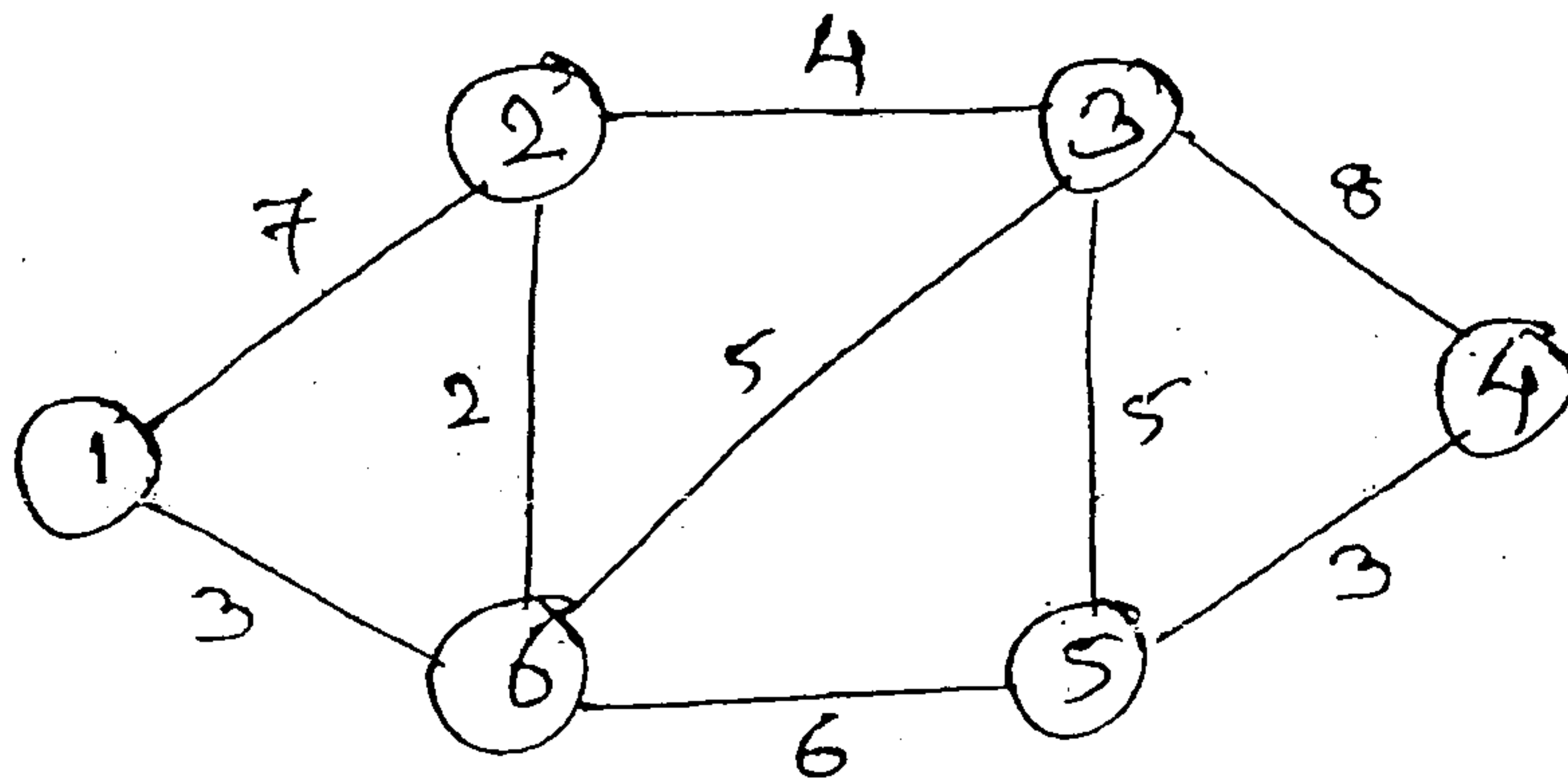
QP Code : NP-19722

(3 Hours)

[Total Marks : 80

- N.B. : (1) Solve any **four** from **six** questions.
(2) Assume suitable data wherever required.

1. (a) Explain O , Ω and θ Notations with the help of Graph. And represent the following function using above notations. 10
 - (i) $T(n) = 3n + 2$
 - (ii) $T(n) = 10n^2 + 2n + 1$
- (b) Explain 0/1 Knapsack Problem with example. 10
2. (a) Write an algorithm of sum of subsets. Solve following problem and draw portion of state space tree $M = 35$, $W = (5, 7, 10, 12, 15, 18, 20)$. 10
- (b) Explain longest common subsequence with example. 10
3. (a) Explain all pair shortest path algorithm with suitable example. 10
- (b) Explain different string matching algorithms. 10
4. (a) Write a Min Max function to find minimum and maximum value from given set of values using divide and conquer. Also drive its complexities. 10
- (b) Comment on any two modules of computation. 10
5. (a) To find Dijkstra's shortest path from vertex 1 to vertex 4 for following graph. 10



- (b) Explain flow shop scheduling with example. 10
6. Write note on :— (any two) 20
 - (a) Job sequencing with deadlines
 - (b) Randomized Algorithm
 - (c) The 15 Puzzle Problem
 - (d) N-Queen Problem.

29/5/2014

(Comp 4 IT)

COA Sem-IV

(SE comp)

QP Code : NP-19761 IT

(3 Hours)

[Total Marks :80

- N.B.:**— (1) Question no.1 is **compulsory**.
(2) Solve any **three** questions out of remaining **five** questions.
(3) Assume suitable data if **necessary**.
(4) Answer to **each** new question to be started on a **fresh page**.

1. (a) What is stored program concept? 3 ✓
(b) Show IEEE 754 Standards for Binary Floating-Point Representation for 32 bit single format and 64 bit double format. 3 ✓
(c) What are applications of Microprogramming? 3 ✓
(d) What is Virtual Memory? 4 ✓
(e) Explain in brief function of 8089 I/O Processor. 4 ✓
(f) Name the Flynn's Classification of Parallel Processing Systems. 3 ✓
2. (a) Draw the flow chart for Booth's Algorithm for Twos Complement Multiplication. 5
(b) Using Booth's Algorithm show the multiplication of 7×5 . 7
(c) Explain with diagram functioning of Microprogrammed Control Unit. 8
3. (a) What are the differences between RISC and CISC processors? ✓ 5 ✓
(b) Describe hardwired control unit and specify its advantages. ✓ 7 ✓
(c) What are characteristics of memory devices? ✓ 8 ✓
4. (a) Explain in details Memory Hierarchy with examples. 6 ✓
(b) What are elements of cache design? Explain in details. ✓ 8 ✓
(c) What are major requirements for an I/O module? 6 ✓
5. (a) Explain the DMA based data transfer techniques for I/O devices. 8 ✓
(b) Explain concepts of nanoprogramming. 6 ✓
(c) What is instruction pipelining? 6 ✓
6. Write short notes on:
(a) Touch Pad 7 ✓
(b) L1, L2 and L3 Cache memory. 7 ✓
(c) Programmed I/O 6 ✓

QP Code : **NP-19682**

(3 Hours)

[Total Marks : 80

- N. B. : (1) Question no. **one** is compulsory.
 (2) Answer **any three** questions from Q.2 to Q.6.

1. (a) If $A = \begin{bmatrix} x & 4x \\ 2 & y \end{bmatrix}$ has eigen values 5 and -1 then find values of x and y. 5
- (b) Evaluate $\int_c (\bar{z} + 2z) dz$ along the circle $c: x^2 + y^2 = 1$. 5
- (c) State true or false with justification: If the two lines of regression are $x + 3y - 5 = 0$ and $4x + 3y - 8 = 0$ then the correlation coefficient is +0.5. 5
- (d) Find dual of following LP model 5
- $\max z = 2x_1 + 3x_2 + 5x_3$
 subject to
 $x_1 + x_2 - x_3 \geq -5$
 $x_1 + x_2 + 4x_3 = 10$
 $-6x_1 + 7x_2 - 9x_3 \leq 4$
 & $x_1, x_2 \geq 0$ and x_3 is unrestricted.
2. (a) Using Cauchy's integral formula, evaluate $\int_c \frac{(12z - 7) dz}{(z - 1)^2 (2z + 3)}$ where 6
- $C: |z + i| = \sqrt{3}$.
- (b) Determine whether matrix A is derogatory $A = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$. 6
- (c) In a competitive examination, the top 15% of the students appeared will get grade 'A', while the bottom 20% will be declared fail. If the grades are normally distributed with mean % of marks 75 and S.D. 10, determine the lowest % of marks to receive grade A and the lowest % of marks that passes. 8
3. (a) The daily consumption of electric power (in millions of kwh) is r.v. X with PDF $f(x) = k x e^{-x/3}$, $x > 0$. Find k and the probability that on a given day the electricity consumption is more than expected electricity consumption. 6

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- (b) Using Simplex method, solve the following LPP 6

$$\max z = 15x_1 + 6x_2 + 9x_3 + 2x_4$$

$$\text{s.t. } 2x_1 + x_2 + 5x_3 + 6x_4 \leq 20$$

$$3x_1 + x_2 + 3x_3 + 25x_4 \leq 24$$

$$7x_1 + x_4 \leq 70$$

$$\& \quad x_1, x_2, x_3, x_4 \geq 0$$

- (c) Obtain ALL Taylor's and Laurent's series expansions of function 8

$$\frac{(z-2)(z+2)}{(z+1)(z+4)} \text{ about } z = 0.$$

4. (a) Find the moment generating function of Poisson distribution and hence find mean and variance. 6

- (b) Obtain the equation of the line of regression of cost on age from the following table giving the age of a car of certain make and the annual maintenance cost. Also find maintenance cost if age of the car is 9 years. 6

Age of car (in years) : x	2	4	6	8
Maintenance cost : y (in thousands)	5	7	8.5	11

- (c) Show that the matrix A is diagonalizable, find its diagonal form and 8

$$\text{transforming matrix, if } A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}.$$

5. (a) A sample of 8 students of 16 years each shown up a mean systolic blood pressure of 118.4 mm of Hg with S.D. of 12.17 mm. While a sample of 10 students of 17 years each showed the mean systolic BP of 121.0 mm with S.D. of 12.88 mm during in investigation. The investigator feels that the systolic BP is related to age. Do you think that the data provides enough reasons to support investigator's feeling at 5% LoS? Assume the distribution of systolic BP to be normal. 6

- (b) Using Cauchy's residue theorem, show that $\int_0^{2\pi} \frac{\cos 2\theta}{5 + 4 \cos \theta} d\theta = \frac{\pi}{6}$. 6

[TURN OVER

(c) Using dual simplex method, solve 8

$$\begin{aligned} \max z &= -2x_1 - x_3 \\ \text{s.t. } x_1 + x_2 - x_3 &\geq 5 \\ x_1 - 2x_2 + 4x_3 &\geq 8 \\ \& \quad x_1, x_2, x_3 \geq 0 \end{aligned}$$

6. (a) A total of 3759 individuals were interviewed in a public opinion survey on a political proposal. Of them, 1872 were men and the rest were women. A total of 2257 individuals were in favour of the proposal and 917 were opposed to it. A total of 243 men were undecided and 442 women were opposed to the proposal. Do you justify on the hypothesis that there is no association between sex and attitude, at 5% LoS. 6

(b) Using Kuhn – Tucker's method solve 6

$$\begin{aligned} \text{Maximize } Z &= 2x_1^2 + 12x_1x_2 - 7x_2^2 \\ \text{Subject to the constraints } &2x_1 + 5x_2 \leq 98 \text{ and } x_1, x_2 \geq 0 \end{aligned}$$

(c) (i) Average mark scored by 32 boys is 72 with standard deviation of 8 while that for 36 girls is 70 with standard deviation of 6. Test at 1% LoS whether the boys perform better than the girls. 4

(ii) If the first four moments of a distribution about the value 4 of the random variable are $-1.5, 17, -30$ and 108 then find first four raw moments. 4

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