

Computer Fundamentals

1. (a) Discuss the key components of a CPU with the help of a block diagram.
(b) Compare between the feature of primary and secondary storage devices.

(c) What do you mean by a bus? Name few important buses that are that are used in a computer system.
2. (a) Compare between the features of High level, Assembly and Machine languages.
(b) Discuss the various memory allocation techniques used by a standard operating system.

(c) Briefly explain the functions of an operating system.
3. (a) Write an algorithm to search a number in a sorted list using binary search
(b) Use 2's complement method to perform M-N with the given binary numbers:
M= 1010100 and N = 1000100

(c) Discuss the different stages of an instruction cycle.
4. (a) Define computer network. Discuss the various advantages of having a network.
(b) Briefly discuss the key components of data communication.

(c) Explain the terms web browsers and DNS.
5. (a) Describe Sequential code and self-complementing code with example.
(b) Express the decimal number 653 in the excess-3 code.
(c) Encode data bits 0011 into 7-bit even-parity Hamming code.
6. (a) Explain subroutine linkage mechanism briefly.
(b) Mention five basic components of Data Communication.
(c) How many physical links are required in
(i) simplex and (ii) duplex mode, in mesh topology?
7. (a) What are the advantages of limitations of machine language?
(b) What is the difference between Assembler and Compiler?
(c) What is the difference between server computer and client computer?
(d) What is a Browser and how does it function?

Electronics

- 1 (a) With proper examples discuss on the active and passive circuit elements.
(b) What is the time-constant of R-L circuit? What does it represent for?
(c) State Kirchoff's laws (KCL& KVL). Apply them to find the relation between resistance ratios of a Wheatstone Bridge in balance condition.

- 2 (a) A cube is formed by joining equal wires each of resistance R. Calculate the equivalent resistance between the diagonally opposite corners of a face of the cube.
(b) State Thevenin theorem. Find Thevenin resistance for a Wheatstone Bridge network
(c) What is meant by sharpness resonance in a LCR circuit?

- 3 (a) Explain in brief on the operational principle of a p-n junction Diode.
(b) What is a Zener diode and state its application.
(c) Compare the features of BJT and FET.
(d) What do you mean by (i) open loop gain and (ii) closed loop gain of an OP-AMP.

- 4 (a) What are the differences between Loop Analysis and Nodal Analysis?
(b) Two resistors have the following color codes. Find the value and tolerance of the resistors.
(i) Brown, Black, Black, Gold (ii) Green, Blue, Blue, Silver

5. (a) Explain how depletion layer is formed in a p-n junction diode.
(b) How an extrinsic semiconductor behaves at a very high temperature and why?

6. (a) Describe the physical mechanism for Avalanche breakdown & Zener breakdown.
(b) Design a circuit of "Unity gain buffer" using op-amp.

7. (a) State the Maximum Power Transfer Theorem.
(b) Implement a NOT gate using a BJT.
(c) Explain from the static characteristics of JFET how sometimes it behaves like a
(i) simple resistor, (ii) constant voltage source and (iii) constant current source.

Digital Logic

- 1(a) Prove that a combination of 2-input XOR and 2-input AND is a universal gate.
(b) Design a 4 bit left shift register.

- 2 (a) Implement the following function with a multiplexer:

$$F(A,B,C,D) = \sum(0,1,3,4,8,9,15)$$

(b) With the help of a block diagram, explain the operation of a J-K Master-Slave Flip flop.

3 (a) Design a counter which counts the following sequence:

0,8,12,10,14,19,13,11,15,0,8,12,.....

Use clocked J-K flip flops and NAND gates.

(b) Compare the features of synchronous and asynchronous sequential circuits.

4 Write short notes on :

(a) A/D conversion

(b) PLA

(c) CMOS logic Features

5. (a) Design a combinational circuit that multiplies two 2-bit numbers, a_1a_0 and b_1b_0 to produce a 4-bit product $C_3C_2C_1C_0$ using 2-input NAND gates only.

(b) Design a combinational circuit that has four inputs and four outputs. The output generates the 2's complement of input binary number. Use logic gates only.

6 (a) Design a shift register with parallel load that operates according to the following function table:

Shift	Load	Register Operation
0	0	No Change
0	1	Load Parallel Data
1	X	Shift Right

(b) Describe the operation of the SR latch using NAND gate with the help of truth table, transition table and the circuit.

7. (a) Design a synchronous BCD counter with JK flip-flops.

(b) Explain the "Master-Slave" concept as applicable to a flip-flop.

8 (a) A combinational logic circuit is defined by the following Boolean functions:

$$F(A,B,C,D) = \sum(0,2,5,6,7,8,9,10)$$

Design the circuit using 8x1 multiplexer and also design with 4x1 multiplexer with additional logic gates.

(b) Describe briefly the working of a successive approximation A/D converter.

Computer Organization

- 1 (a) Explain one address and three address instructions with examples.
(b) Describe any four addressing modes with examples.
2. (a) Explain different levels of cache memory. Describe different cache write policies.
(b) Discuss micro-instruction sequencing using Wilkes' design.
(c) Explain the use of virtual memory in computer memory hierarchy.
3. (a) Describe the use of tri-state buffer in system bus design. Suggest an alternative method
(b) Using Booth's algorithm, multiply $(1001)_2$ by $(1100)_2$.
(c) Differentiate between vectored and non-vectored interrupts.
- 4(a) What do you mean by memory hierarchy? Explain with appropriate diagram. What is hit ratio?
(b) What are the different types of cache mapping? Briefly explain one of them using appropriate diagram.
- 5(a) Explain the operation of a micro-programmed Control-unit. What are the advantages of a micro-programmed Control unit over hardwired Control unit?
(b) What do you mean by interrupt? Define vectored-interrupt with diagram.
- 6 Write short note on
 - a. DMA
 - b. Four-stage instruction pipelining
 - c. Memory mapped I/O vs I/O mapped I/O

Data Structures

1. (a) Discuss the different notations for measuring complexity of an algorithm.
(b) What is tri-diagonal matrix? How it is represented using array?
(c) Write an algorithm to delete the last node in a circular linked list.
2. (a) Convert the following infix expression into its equivalent postfix form. Show detailed stack operations in each step.
 $A*B+C-D/E+F$
(b) What is a priority queue? State its applications,
(c) Write down an algorithm to implement the pop() operation of a stack using a singly linked list.

3. (a) What are different collision resolution techniques? Explain in details.
 (b) What is a binary search tree? Write an iterative function to create a BST with n nodes.
4. (a) State the differences between internal sorting technique and external sorting technique.
 (b) When it is better to use linear search technique than to use binary search technique? What is the worst case time complexity of linear search technique applied on an array of size n?
 (c) Write down an algorithm to perform insertion sort on an array.
- 5(a) State and explain the notations used for quantitative assessment of algorithm complexity.
 (b) Let $f(n) = 5n^2 + 2^n + 7$. State the complexity of $f(n)$ in terms of Big 'oh' notation.
- 6(a) Write an algorithm to implement a stack using linked list.
 (b) What is a doubly linked list?
- 7(a) What is binary tree? State and explain with an example the insertion and deletion operation on a binary search tree.
 (b) What is meant by external and internal path lengths?
- 8(a) Write a recursive algorithm to perform quicksort.
 (b) Show how quicksort works on the following sequence of numbers:
 93, 2, 7, 8, 17, 1.
- 9(a) State the need of hashing.
 (b) Discuss any two hashing techniques.
 (c) What is collision? State any one technique for collision resolution.

Discrete Maths

1. (a) A computer system considers a string of decimal digit a valid codeword if it contains an even number of '0' digits. For instance, 1230407869 is valid, whereas 120987045608 is not valid. Let a_n be the number of valid n-digit code words.
 (i) Find the recurrence relation for a_n .
 (ii) Find the explicit formula for an using generating function.

(b) Using method of induction prove that $n^3 < 2^n$ for $n > 10$

2. (a) Find the number of permutations when six(6) letters at a time are taken from the word "ENGINEERING".

(b) Explain what we mean by Dijkstra's algorithm in graph theory. Calculate the shortest path from vertex=B. The weight matrix of the said graph is shown below. You have to show the detail path of each step of your calculation:

	A	B	C	D	E	F	G	H
A	0	0	3	0	0	0	0	0
B	4	0	0	3	0	0	0	0
C	0	1	0	0	8	0	0	0
D	0	0	2	0	0	0	0	0
E	0	0	0	0	0	8	3	0
F	0	0	0	0	0	0	0	4
G	0	0	0	0	0	1	0	0
H	0	0	0	2	0	0	1	0

3. (a) Explain generalized pigeon hole principle. Assume that in group 6 people, each pair of individuals consists of 2 friends or 2 enemies. Show that there are either 3 mutual friends or 3 mutual enemies in the group. Apply generalized pigeon hole principle to prove it.

(b) Explain principle of inclusion and exclusion with example. Calculate the number of integers between 1 and 250 that are divisible by any of the integers 2,3,5 and 7. Apply principle of inclusion and exclusion to calculate the above result.

4. (a) What do mean by conditional probability? Give suitable example.

(b) Find the probability that a family with five (5) children does not have a boy if the sexes of the children are independent and if (a) a boy and girl are equally likely, (b) the probability of a boy is 0.51, (c) the probability that the i-th child is a boy is $0.51 - (i/100)$.

5(i) Using method of induction prove that $2n+1 \leq 2^n$ for $n \geq 3$.

(ii) Find the number of permutations when six (6) letter at a time are taken from the word 'RAMAYANAM'.

6(i) Calculate the time complexity of Binary Search algorithm.

(ii) Explain what we mean by Finite probability space. A lot contains 12 items of which 4 are defective. Three items are drawn at random from the lot one after another. Find the probability 'p' that three are non defective.

(iii) Find the probability that a family with five children does not have a boy if the sexes of children are independent and if

- (a) a boy and a girl are equally likely;
- (b) the probability of a boy is 0.51,
- (c) the probability that the i-th child is a boy is $.51 - (i/100)$

7. (i) Explain what is generalized pigeon hole principle. A chess player wants to prepare for a championship match by playing some practice games in 77 days. He wants to play at least one game per day but not more than 132 games altogether. Show that no matter how he schedules the games there is a period of consecutive days within which he plays exactly 21 games.

(ii) Explain what is principle inclusion and exclusion. Calculate how many integer numbers between 1 and 250 are divisible by 21, 3, 5 and 7.

(iii) What is the probability that the numbers 11, 4, 17, 39 are drawn in that order from a bin containing 50 balls labeled with the numbers 1, 2, 3, . . . , 50, if

- (a) the ball selected is not returned to the bin before the next ball is selected and
- (b) the ball selected is returned to the bin before the next ball is selected.

8 Explain (i) Breadth First method (BFS) and (ii) Depth First method (DFS) to traverse graph from a vertex v_i to another vertex v_j . Apply BFS, DFS method on the following graph represented by the corresponding adjacency lists:

Table – 1 Adjacency List:

Adjacency List
A: F, C, B
B: C, G
C: F
D: C
E: C, D, J
F: D
G: C, E
J: D, K
K: E, G

- (i) Calculate the total tree traversal from vertex-A using BFS method.
- (ii) Calculate the total tree traversal from vertex-J using DFS method.

Operating Systems

- 1. (i) Distinguish between long term scheduler and short-term scheduler.
- (ii) What is processor thrashing?

(iii) Consider the following table:

Process	Arrival time	Burst time	Priority
P0	0	7	2
P1	5	4	3
P2	6	2	2
P3	6	4	3
P4	6	3	1

Calculate the average turn-around time using SJF, Priority and FCFS scheduling algorithms considering lowest number has the highest priority.

- 2. (i) State and explain the necessary conditions that must hold for a deadlock situation to arise.
- (ii) What is resource allocation graph (RAG)? How it can be used for deadlock detection.
- (iii) Discuss any two deadlock recovery techniques.
- 3. (i) Define semaphore.
- (ii) How can we remove busy waiting in a semaphore?
- (iii) Develop a solution to the Bounded Buffer producer consumer problem using semaphore as synchronization primitive.

4. (i) Explain the drawbacks of contiguous memory allocation.
(ii) Consider the following scenario in a system.

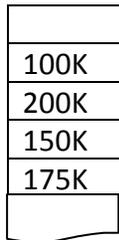
$$MAX = \begin{bmatrix} 7 & 7 & 7 \\ 4 & 3 & 0 \\ 2 & 6 & 2 \end{bmatrix}$$

$$ALLOCATION = \begin{bmatrix} 2 & 3 & 4 \\ 2 & 1 & 0 \\ 1 & 3 & 0 \end{bmatrix}$$

$$AVAILABLE = [5 \ 5 \ 5]$$

Discuss whether the system is in a safe state or not.

- (iii) Consider the following fixed partitioning scheme of the main memory.



Show the allocation schemes for the following processes using First-fit, Best-fit and Worst-fit allocation schemes for four processes having requirements

120K, 180K, 150K, 140K.

Assume that the processes have arrived in the given sequence.

5. (i) Distinguish between long term scheduler and short term scheduler.
(ii) A critical section problem must possess a solution – Justify.
(iii) Explain the resource manager and virtual machine view of an operating system.
(iv) Explain briefly the concepts of Simple batch systems, Multi programmed batch systems and
(v) State and explain the necessary conditions that must hold for a deadlock situation to arise.
(vi) What is a resource allocation graph (RAG)? How it can be used for deadlock detection when the system has a single instance of each resource type?

6. (i) Define thrashing.
(ii) Briefly discuss any one page replacement algorithm that suffers from Belady’s anomaly.
(iii) Consider the following scenario in a system:

	Max			Allocation			Available		
	A	B	C	A	B	C	A	B	C
P0	7	5	3	0	1	0	3	3	2
P1	3	2	2	2	0	0			
P2	9	0	2	3	0	2			
P3	2	2	2	2	1	1			
P4	4	3	3	0	0	2			

Discuss whether the system is in a safe state or not.

7. Write short notes on:

- (i) Virtual memory using segmentation.
- (ii) System Calls.
- (iii) Deadlock avoidance techniques.
- (iv) Disk Scheduling methods.

Finite Automata

1(i) Define a parse tree with respect to context free grammar. Consider grammar G whose production rules are $S \rightarrow aAS|a$, $A \rightarrow SbA|SS|ba$. Show that $S \Rightarrow aabbba$ and construct a derivation tree whose yield is $aabbba$.

(ii) Differentiate between Mealy and Moore Machine.

(iii) What do you mean by State Equivalence (SE) algorithm? Construct a minimum state automation equivalent to finite state automation:

Present State	Next State	
	X=0	X=1
$\rightarrow q_0$	q1	q5
q1	q6	q2
q2	q0	q2
q3	q2	q6
q4	q7	q5
q5	q2	q6
q6	q6	q4
q7	q6	q2

[Note: Here q0=initial state, q7=final state]

2(i) Define a non-Deterministic Finite State Automation (N DFA). Convert the following

N DFA to DFA:

Present State	Next State	
	X=0	X=1
→ q0	{q0,q3}	{q0,q1}
q1	q4	q2
q2	{q2,q4}	q2
q3	q4	q1
q4	q4	q4

[Note: Here q0=initial state, q4=final state]

(ii) Test a string L=01100 is valid or invalid in DFA.

3(i) Construct a Finite Automation equivalent to the regular expression.

$$(0+1)^*(00+11)(0+1)^*$$

(ii) Let $G = (\{S, A_1\}, \{0,1,2\}, P, S)$, where P consists of $S \rightarrow 0SA_12$, $S \rightarrow 012$, $2A_1 \rightarrow A_12$, $1A_1 \rightarrow 11$.

$$\text{Show that } L(G) = \{0^n 1^n 2^n \mid n \geq 1\}$$

(iii) Construct a reduced grammar equivalent to the grammar

$$S \rightarrow aAa, A \rightarrow Sb|bCC|DaA, C = abb|DD, E \rightarrow aC, D \rightarrow aDA.$$

4(i) Describe how a Turing machine works. How we represent a Turing Machine.

Consider a Turing Machine as shown in table below. Draw the computation sequence of the input string '00b' on the initial state q1 on the same machine:

Present State	Tape Symbols		
	b	0	1
→ q1	1Lq2	0Rq1	-
q2	bRq3	0Lq2	1Lq2
q3	-	bR4	bRq5
q4	0Rq5	0Rq4	1Rq4
q5	0Lq2	-	-

[Note: q1=initial state; q5=final state]

(ii) Discuss the feature of 4 different types of Grammar classified by Chomsky.

Computer Networks

1 Write short notes:

- (i) TDM.
- (ii) Stop and Wait ARQ Protocol.
- (iii) D/A and A/D encoding.

2 (a) Discuss the basic features of LAN, MAN and WAN.

(b) (i) What are the different types of signal attenuation encountered in computer networks and how it is measured?

(ii) State Shannon's capacity of a channel. Find out the capacity of an extremely noisy channel in which the value of a signal-to-noise ratio is almost zero.

3(a) Explain the significance of the following IP address:

- (ii) Loop back address.
- (iii) Limited Broadcast address.
- (iv) Specific host on this address.
- (v) Direct Broadcast address.

(b) What are the advantages of using fibre optic cables over conventional transmission media?

4. (i) Explain the concept of Manchester and Differential Manchester encoding with a suitable example.
 (ii) Explain CSMA/CD with a suitable diagram.
 (iii) Differentiate between bit rate and baud rate.
5. (i) Explain the three types of transmission impairment.
 (ii) State Shannon's capacity of a channel. Calculate the data rate of a T1 carrier.
 (iii) Write a short note on TDM.
6. (i) State the responsibilities of data link layer in OSI architecture.
 (ii) In stop-and-wait flow control, define and discuss the handling of a damaged frame and a lost frame.
 (iii) Compare and contrast between two types of sliding window ARQ error control.

Database Systems

1. (a) Compare and contrast DBMS and traditional file processing system.
 (b) Distinguish between Database Manager & Database Administrator.
 (c) Define a relation mathematically and explain its significance in context to RDBMS.

2. (a) Write the relational algebra expressions for the given relational schemas.

Hotel (Hotel No, Hotel Name, City)

Room (Room No, Hotel No, Type, Price)

Booking (Hotel No, Guest No, Date From, Date To, Room No.)

Guest (Guest No, Guest Name, Guest Address)

- (i) List the price and type of all rooms at the "ABC" hotel.
 - (ii) List all guest currently staying at "ABC" hotel.
 - (iii) List the details of all rooms at the "ABC" hotel, including the name of the guest staying in the room, if the room is occupied.
- (b) Show that SQL is relationally complete.
 - (c) Give an example to show that BCNF is stronger than 3NF.

3. (a) Describe essential features of Distributed Database System
 (b) Draw an ER diagram of Hospital Management system.
 (c) With an example distinguish between Tuple & Domain Relational Calculus.
 (d) Distinguish between Primary and secondary index. Give examples.

4.(i)What are the roles of DDL and DML in a DBMS?

(ii)State the salient features of a relational data model.

(iii)What do you mean by data abstraction? What are the different levels of abstraction?

5 (i)Explain: SQL is relationally complete.

(ii) State with example the Division operation between two relations, also state for what type of relational queries it is used.

6(a) Write the relational algebraic queries for the given relation schemas:

DEPARTMENT (Dnumber, Dname, Manager)

EMPLOYEE (Name, Address, EMI, Dnumber, Date of birth)

PROJECT (Pname, Plocation, Dnumber, Pnumber)

WORKSON (EMI, Pnumber)

- a. Give the name and address of all employees who work for the 'R & D' department.
- b. List the name, department name, address and date of birth of all employees working for the projects located at 'Stafford'.
 - i. What do you mean by derived horizontal fragmentation. Explain with the help of an example.

7(a) What is the need of normalization for relation schemas? What do you mean by functional dependency?

(b) Consider the following relation schema:

UNIVERSITY (student_id, student_name, programme, subject, subject_name, credits, number_of_hrs, date_of_registration, programme_duration).

Please note the following points:

A student can enroll for many programmes.

A programme may consist of many subjects. One subject belongs to only one programme.

(i) What are the functional dependencies in the above relation?

(ii) Normalize the relation to first 2NF and then to 3NF if required.

Numerical Methods

1 (a) Describe Bisection method to solve non-linear equation. Solve the following equation between $x=-3$ and $x=-2$ using Bisection method to get all solutions correct up to 3 places after decimal point:

$$x^3 - x + 11 = 0$$

(b) Derive the formula to calculate value of a integral using Trapezoidal rule. Calculate value of the integral using Romberg's Integration method.

$$4 \int_0^1 (dx / (1 + x^2))$$

(5+5)

2. Using simplex method obtain the inverse of a matrix
A =

1	2	3
3	-2	1
4	2	1

3. Apply Matrix minima method to calculate basic feasible solution of the following transportation matrix. Calculate optimal transportation cost using MODI method.

Origin	Destination				Capacity
	1	2	3	4	
1	6	4	1	5	14
2	8	9	2	7	16
3	4	3	6	2	5
Requirement	6	10	15	4	25

4. XYZ Airline operating 7 days a week has given the following time-table. Crews must have a minimum layover of 5 hrs. between flights. Obtain the pairing flights that minimizes layover time away from home. For any given pairing the crew will be based at the city results in the smaller layover:

Chennai → Mumbai			Mumbai → Chennai		
Flight No.	Departure Time	Arrival Time	Flight No.	Departure Time	Arrival Time
A1	6:00 AM	8:00 AM	B1	8:00 AM	10:00 AM
A2	8:00 AM	10:00 AM	B2	9:00 AM	11:00 AM
A3	2:00 PM	4:00 PM	B3	2:00 PM	4:00 PM
A4	8:00 PM	10:00 PM	B4	7:00 PM	9:00 PM

Object Oriented Programming

- 1(a) Explain the advantages of object oriented programming over procedure programme.
 (b) Explain the difference between multiple and multilevel inheritance with suitable examples.
 (c) What is a friend function? What are the merits and demerits of using friend function?
 (d) When do we make a class virtual? What is an abstract class?
 (e) Explain with example, how operator > are overloaded.

2. (a) What is the objective of constructor and destructor? Write a program to overload constructor.

(b) Explain how friend function can access private data of another class.

3 (a) Differentiate between compile time polymorphism and run time polymorphism with suitable examples.

(b) What is namespace? How you can define your own namespace?

(c) How exception handling concept is beneficial in any object-orient programming language?)

4 (i) State briefly on the major characteristics of object oriented programming languages.

(ii) Discuss template with proper example.

(iii) Explain the concept of error and exception in the context to a java program.

(iv) Explain the advantages and disadvantages of OOPS over structured oriented programming.

(v) Describe multiple inheritance in the context of java.

5 What do you mean by the constructor of a class? What do you mean by constructor overloading, state with a suitable example? What is a copy constructor?

6 (a) Explain the concept of method overriding using a suitable java program.

(b) What do you mean by runtime polymorphism? What is an abstract class?

Computer Graphics

1. (i) Explain Sutherland Cohen Clipping Algorithm. Given clipping window A(20,20), B(60,20), C(60,40), D(20,40). Using Sutherland Cohen algorithm find the visible portion of a line segment joining the points P(40,80) and Q(120,30).

(ii) Consider a window having co-ordinates A(0,0), B(1023,0), C(1023,1023) and D(0,1023). The line joining the two points P(-307,631) and Q(820,-136) in screen coordinates. Find which portion of this line is visible in the screen by using mid point subdivision method.

2 (i) Explain Bresenham Circle generation algorithm. Draw flowchart for Circle draw method.

Consider an origin centered circle of radius 8. Determine the pixels that will be put on.

Find the pixels of 1st quadrant and apply reflection to obtain the points of 4th quadrant, 3rd quadrant and finally 2nd quadrant.

(ii) Explain seed fill algorithm to color a bounded region. Consider the boundary defined

polygon defined by the vertices (1,1), (1,5), (4,5), (4,1). Choose the initial seed point at (2,3). Show how you can color the bounded region using seed fill algorithm.

3 (i) Derive the transformation matrix for rotating any object about an axis passing through the origin (0,0,0) and (10,0,10).

(ii) Reflect a diamond-shaped polygon whose vertices are A(-1,0), B(0,-2), C(1,0), D(0,2) about a horizontal line $y=x+2$.

4. (i) Draw a line using Generalized Bresenhan's Algorithm from (0,0) to (-4,-8).

(ii) Explain the term Homogeneous co-ordinate system.

(iii) Explain the term Morphing.

5. (i) Describe seed fill algorithm to fill color in a rectangular plane. Consider the boundary defined polygon defined by the vertices (1,1),(1,5),(4,5),(4,1). Choose the pixel at (2,3) as the seed and apply seed fill algorithm to color the rectangular surface. Show stack contents at all intermediate steps.

(ii) Show that a 2D reflection through X-axis followed by a 2D reflection through the line $y= f\{x$ is equivalent to pure rotation about one origin.

6. (i) A clipping window A(100,10), B(160,10), C(160,40), D(100,40). Using Sutherland-Cohen clipping algorithm find the visible portion of the line segments E(50,0) and F(70,80). Also find the visible portion of the line segment G(120,20) and H(140,80). (6)

(ii) A unit cube with mutually perpendicular faces parallel to the X-Y, Y-Z and Z-X planes respectively is projected onto the XY plane under the parallel projection whose direction of Projection is (1,1,1). Obtain the projection of the cube and draw it.

Software Engineering

1(a) Why is software development considered as an engineering approach?

(b) Discuss the spiral model of S/W engineering process.

(c) Define S/W development life cycle. Explain the term SRS.

2(a) Discuss the basic COCOMO model.

(b) Explain the concept of modular design.

(c) Explain the concept of function independence with respect to software maintenance.

3 (a) Explain software quality assurance in detail.

(b) What is software reliability?

(c) Explain the various software testing strategies.

4. (i) What is Software crisis?

(ii) Discuss the features of spiral model.

(iii) What are the characteristics of good SRS document?

5. (i) Draw an activity network diagram for an MIS application to be described by you.

(ii) Distinguish between White box and Black box testing.

(iii) Explain the features of COCOMO.

6. (i) Define Software Quality. How is Software Quality Assurance performed?

(ii) Distinguish between Coupling and Cohesion.

(iii) Draw the control flow graph of the code below & also find the cyclomatic complexity.

```
int find-maximum(int i, int j, int k)
{
int max;
if(i>j) then
if(i>k) then max=i;
else max=k;
else if(j>k) max=j;
else max=k;
return(max);
}
```

Microprocessor

1 (a) Discuss how the address and data lines of 8085 are multiplexed.

(b) What are the roles of Program Counter and Stack Pointer?

(c) Discuss on the various addressing modes available in 8085 with proper examples.

2. (a) Explain on the utility of *INTR* and \overline{INTA} signals of the 8085 microprocessor.

(b) Discuss the stack operations performed on a subroutine call and return during 8085 program execution.

(c) What do you mean by software interrupts?

3. (a) Write an 8085 program for converting to check whether the data stored at location 2001H through 2005H is a palindrome or not.
- (b) State the operation of a DAD instruction with a given example.

Design and Analysis of Algorithms

- 1 (a) Define and explain the significance of Big-Oh, Big-Omega and Big-Theta asymptotic notations.
- (b) Show that if $f(n)=2^n+n^2$ and $g(n)=2^n$ then $f(n) \in \text{Big-Oh}(g(n))$.
- 2(a) Derive an expression for the average computing time of merge sort algorithm.
- (b) Explain Divide and Conquer algorithm design strategy.
- 3 (a) Write an algorithm to insert a node in a AVL tree.
- (b) Define the class NP and show that $P \subseteq NP$.
4. (i) Distinguish between BFS & DFS.
- (ii) Obtain the Worst Case Complexity of Quick Sort.
- (iii) Give Bellman Ford Algorithm for computing the single source shortest paths for general weights.
5. (i) Write an algorithm to insert a key value in a m-way search tree.
- (ii) Distinguish between NP-hard class & NP-Complete class of problems.
- (iii) Compare critically between Dynamic Programming & Greedy algorithms.
6. (i) Establish Prim's Minimal Spanning Tree Algorithm.
- (ii) Explain Big-Oh and Big-omega notations. Give examples.
- (iii) Binary search is a Divide and Conquer Algorithm. – Justify.

Compiler Design

1. (a) Explain the role of 'Table Management Routine'.
- (b) "Separate Symbol Tables should be maintained for identifiers, label names and procedure names" – Justify.
- (c) What are the various methods of intermediate code representation? Explain with suitable examples.
2. (a) What is a syntax tree?
- (b) Draw a syntax tree for the following regular expression using cat-mode notation.
- (a/b)* abb#

(c) Explain what do you mean by the following functions: nullable(n), firstpos(n), lastpos(n) and followpos(n) in connection to syntax tree. Calculate the values of the afore mentioned four functions for the regular expression given in (b).

3. (a) Draw the transition diagram to extract

(i) Unsigned numbers.

(ii) Relation operators.

(iii) Identifiers.

(b) What is LEX?

(c) Write a LEX program that copies a file, replacing each non-empty sequence of white space by a simple blank.

4. (a) Explain what is meant by syntax Directed Translation.

(b) What do you mean by –

(i) Synthesised Attribute.

(ii) Inherited Attribute.

(c) Show the parse tree with inherited attribute to evaluate $3*4+8/2-4n$.

5. Explain the following –

(a) Loop optimization.

(b) Flow Graph.

(c) Activation Record.

Web Page Design

1. (a) Give the difference between web sever & application server.

(b) Write a short note on URL.

(c) Explain meta-tag & frame-tag of HTML.

2. (a) Give the frame format of http protocol .

(b) Give examples of an one audio tool and explain its working.

(c) Write a short note on Morphing.

3. (a) Distinguish between video and images.

(b) What is DNS? Explain its purpose with a suitable example.

(c) What is Tweening ?

Current Technologies

1. (a) Discuss on the key features of a distributed system.

(b) What is RPC? Explain.

2. (a) Discuss the key advantages of wireless communication. What are the different type of signal losses that occur in wireless communication?

(b) Discuss the different multiplexing techniques in wireless communication.

3. Write short notes on

(a) Spread Spectrum.

(b) Monolithic & Microkernel.

(c) Hidden and Exposed Terminal Problem in Wireless Communication.