General Concepts

1. (a) What are combinational circuits?
    (b) Perform the following:
        (i)   Convert $(0.5625)_{10} = ($ $)_2$
    (ii) $(010010)_2 - (100011)_2 = ($ $)_2$

2. (a) Using truth table prove that $\overline{A \cdot B} = \overline{A} + \overline{B}$
    (b) Construct the logic circuit for the Boolean expression
        $$(x+y+z) \cdot (x + \overline{y}) \cdot (\overline{x} + \overline{y})$$

3. (a) Why NAND and NOR gates are called Universal gates?
    (b) How NAND is used to represent OR gate?
    (c) Explain:
            (i) WAN   (ii) INTERNET   (iii) Virus

4. (a) What are the differences between RAM and ROM?
    (b) Explain the merits and demerits of machine language.
    (c) What is multimedia?

5. (a) What is secondary storage? How does it differ from a primary storage?
    (b) Explain the functions of
            (i) cache memory   (ii) Register

6. (a) Draw a block diagram and explain the functions of the various components of a computer System.
    (b)   Write a short note on computer network.

7. (a) Explain the following tasks of Operating System
            (i)   Process management
            (ii) Memory management
            (iii) File system management
            (iv) Device management
    (b) What do you understand by the real time concept?

8. (a) What do you mean by scheduling?
            Discuss SJF scheduling technique.

(b) Differentiate between single user and multi-user operating system with examples.

9. (a) Draw the conceptual view of operating system and explain.
   (b) What is the difference between multi-tasking and multi-processing.

10. (a) Explain the different phases of an Instruction cycle.
(b) Perform the following:
(i) Convert $(23.255)_{10}$ to binary
(ii) $(110010)_2 - (100011)_2 = (?)_2$ using 2's complement.
(c)Explain the working principle of S-R flip-flop.

11 (a) Explain the functions of (i) Program counter (ii) MAR
(b) Distinguish between Compiler and Interpreter.
(c) What is a loader?

12. (a) State and prove De Morgan's theorem in Boolean Algebra.
(b) What are universal gates? Why are they so called? Represent the basic logic gates using NAND gates.
(c) Simplify the following Boolean expression using Karnaugh Map.
A'B+ABC'+ABC

13. (a) Distinguish between LAN and WAN.
(b) Discuss briefly the functions performed by an operating system.
(c) What is a search engine?

14. (a) Distinguish between internal and external fragmentation.
(b) What do you understand by multiprogramming?
(c) Write a brief note on file management.

15. (a) What are the functions of Cache memory?
(b) Discuss on page replacement algorithm.
(c) Given the following structure:
With the SRTF scheduling algorithm, obtain the average waiting time. (4)

Process	Arrival Time	Burst Time
P1	1	7
P2	3	3
P3	5	4

Data Structures

1. (a) Define an algorithm.
(b) Explain complexity of an algorithm.
(c) Calculate the complexity of linear search algorithm for all cases.

2. (a) What are the advantages of Linked List over array?
(b) Differentiate between recursive and non-recursive algorithm.

3. Describe quick sort technique with a suitable set of data. What is the best case and average case time complexity of quick sort?

4. (a) Define a binary tree.
(b) Inorder and preorder sequence of nodes in a binary tree is given below:
Preorder : G B Q A C K F P D E R H
Inorder : Q B K C F A G P E D H R
Draw and explain the logic used to construct the tree.

5. (a) Define stack and queue.
(b) Convert the following infix expression into postfix expression manually and verify it using stack.
A + (B * C - (D / E^F) * G) * H.
Give example of each.

6. What is queue? Convert the given infix expression to postfix form using stack:

$$(((A/(B\text{^}C))+(D*E))-(A*C))$$

7. (a)   What do you mean by complexity of an algorithm?

   (b)   Explain best case, worst case, and average case complexity with the help of an example.

   (c)   Differentiate between static and dynamic allocation.

8. (a)   The sequence of nodes obtained by traversing a binary tree are given below:

        Inorder sequence :   D, G, B, H, E, A, F, I, C

        Preorder sequence: A, B, D, G, E, H, C, F, I

        Construct the tree.

    (b)   In what type of applications can stack be used?
With an example show the difference between linear search and binary search.

Database Systems

1. (a) Describe the three-tier architecture of DBMS.
(b) Explain logical and physical data independence.
(c) Discuss primary key and candidate key of a relation with examples.

2. (a) Describe the different types of relationships that may exists in ER Diagram.
Give example of each.
(b) Discuss referential integrity constraint with example.
(c) Explain DDL and DML with examples.

3. (a)   Explain the 3-level DBMS architecture.

    (b)   Write a short note on Data independence.

    (c)   What are the different database languages?

4. (a)   What is normalization? Explain the need for normalization.

    (b)   Explain functional dependency with example.

    (c)   Describe 2NF with example.

5. (a)   Differentiate between strong entity and weak entity.

    (b)   Explain referential integrity with example.

    (c)   What is database audit? Explain the importance and utility of database log.

Computer Organization

1.   (a) Obtain the simplified Boolean function of the Full adder in sum of product form and
    draw the logic diagram using NAND gate.
    (b) Simplify the Boolean function $F(A,B,C,) = S (0,2,6)$ having the don't care condition

$$d (A,B,C,) = S (1,3,5,)$$

2. (a) Give the merits of the floating point and fixed point representations for storing real numbers.
   (b) Perform, by using 2's complement method $(-17)_{10} - (-13)_{10} = (?)_{10}$

   (c) Differentiate between cache memory and virtual memory.

3. (a) Explain J/K Flip-flop. Discuss how Race around condition can be solved by using MASTER-SLAVE J/K flip- flop.

   (b) What is the difference between zero-address, one-address and two-address instructions ?

   Illustrate with the help of examples.

4. (a) What is microinstruction? Design logic unit with the help of truth table.
   (b) Explain the organization of control unit.

5. (a) Discuss in brief how the data transfer takes place between CPU and peripheral.
   (b) Differentiate between memory mapped I/O and I/O mapped I/O with diagrams.

6. a) Discuss memory hierarchy.
   (b) Explain zone bit recording with respect to storage organization of a hard disk.

   (c) What are the different types of secondary memories?

7. (a) What is the weight, if any, of the most significant bit of a n-bit 2's complement number.
(b) Show that the dual of the exclusive-OR operation is equivalent to its complement.
(c) Simplify the Boolean function $F(w,x,y,z)= S(1,3,7,11,15)$ having the don't care condition
   $d(w,x,y,z)= S(0,2,5)$

8. (a) Implement a full subtractror with two half subtractors or an OR gate.
(b) Design a full-adder using suitable multiplexer(s).

9. (a) Write a short note on MASTER-SLAVE flip-flop. Show how a D flip-flop can be implemented using a J-K flip-flop.
(b) Explain the utilities of Program Counter and Stack Pointer.

10. (a) Define the terms microinstructions, microprogram and microprogrammed control unit.
(b) Discuss memory hierarchy.
(c) Explain the difference between direct mapping, associative mapping and set associated mapping.

11. (a) Differentiate between microprocessor and microcomputer.

(b) Explain the basic set of microprocessor instructions with examples.
(c) Write down the difference between direct addressing mode and indirect addressing mode.

12. (a) Write down the fundamental difference between a subroutine call and an interrupt request.
(b) Briefly discuss how data transfer take place between an external device and memory.
(c) Explain the organization of CPU.

Object Oriented Concepts

1. (a) How does an object-oriented program implement the concept of data reusability? Describe with an example.
(b) Why an object is defined as an instance of a class?
(c) Differentiate between object-oriented programming and procedure oriented programming.

2. (a) Explain friend function with example.
(b) Write a program to demonstrate the uses of private data members.

3. (a) What do you mean by the constructor of a class? What are the different types of constructor? Illustrate.
(b) What is a static date member?

4. (a) What is the problem of using multipath inheritance in a program? Explain with an example.
(b) Illustrate the differences between method overloading and method overriding.
(c) What is reference of a variable?

5. (a) Write short notes on:
(i) Polymorphism
(ii) Data hiding
(iii) Static object
(b) How destructor is invoked in an OOP?

6 (a)Differentiate between procedure oriented language paradigm and object-oriented paradigm.
(b) What are the different access specifiers available in a class in OOP language?

(c) What do you mean by function overloading? Give example.

7. (a)   Illustrate the concept of multiple inheritance.

(b)   In a multilevel inheritance, in which order the destructors of different classes are invoked? Explain with suitable examples.

(c)   Define friend function with an example. Differentiate between friend function

   and   friend class.

3.

8 (a)   Explain the differences between early binding and late binding in OOP.

(b)   Explain virtual base class with example.

(c)   What is copy constructor?