1. Given \( S = \{1, 2, 3, \ldots, 10\} \) and relation \( R \) on \( S \)
(a) Where \( R = \{(x, y) \mid x + y = 10\} \). What are the properties on the relation \( R \).
(b) Explain adjacency and incidency matrices of a graph with a graph.
(c) Prove that \((P \implies Q) \iff (\neg PVQ)\)
(d) Define the words monoid homomorphism and semi group homomorphism.
(e) Show that the set \( \gamma \rightarrow \) is functionally complete.

2. (a) Find the transitive closure of the directed graph represented by the relation.
\( R = \{(a, b), (b, a), (b, c), (c, a), (c, d), (d, c)\} \) on the set \( A = \{a, b, c, d\} \)
(b) Define a binary tree. Draw the corresponding binary tree for the expression \((a \cdot b) \cdot (c \cdot d)\).

3. (a) Explain the properties of homomorphism. Explain tree and bound variables.

4. (a) Obtain the grammar for the language \( L = \{0^i j^j \mid i \neq 7 \text{ and } i, j > 0\} \)
(b) Define isomorphism of two graphs. Show that the graphs given below are isomorphic.

PGDCPA-1.2 Computer Organizations

1. (a) Write a block diagram explain DMA and DMA transfer.
(b) What are the Basic Differences from the modes of Data Transfer
2. (a) Distinguish between RAM and ROM and explain its various types.
(b) Explain about Interrupts.
3. Explain different types of number systems and show with an example.
   (a) Conversion of number from binary to decimal and hexadecimal.
   (b) Differentiate main memory and associate memory.
   (c) Explain the role of cache memory.
4. (a) What are the differences between combinational and sequential circuits.
   (b) Explain page, page number and page fault.
5. Compare and contrast CPU I/O processor communication in IBM370 and Intel 8089 I/O processor.

PGDCPA-1.3 Data Communications

1. (a) Explain about the Layered Architecture of OSI reference Model?
   (b) Differentiate between OSI and TOP/PI reference Model?
2. (a) Explain various steps Involved in Analog and Digital Encoding.
   (b) What is Multiplexing and explain in detail the TDM?
3. (a) Explain the types of errors and differentiate between feedback and forward error control?
   (b) Explain various error control mechanisms
4. (a) What is the need or use of compression techniques?
   (b) Find the HUFFMAN code for the string AAAABBCD and draw the tree structure.
5. (a) Explain the different methods of continuous RQ?
   (b) What is a bit oriented protocol. Explain various bit oriented protocols in Brief.
   Explain HDLC in detail.

PGDCPA-1.4 Language Processors

1. Explain the general machine structure of IBM/360/370.
2. Explain the detailed flow of PASS-1 & PASS-2 assembler.
3. Explain the detailed flow of PASS-2 macro processor.
4. (a) Explain various loading schemes.
   (b) Explain about direct linking loader.
5. (a) What is the grammar and what are the types of grammar?
   (b) Explain different phases of a compiler.

PGDCPA-1.5 Data Structures and Programming

1. (a) Explain the Representation of polynomial as a data structure and write the algorithm.
   (b) What is HASH Table? Explain any two hash functions with their uses.
2. (a) Define linked list.
   (b) Discuss the representation of Linked Vs Sequential (Arrays)
   (c) Explain the procedure of interesting a node in doubly linked list.
3. (a) Explain QUICKSORT technique with one example and discuss binary search technique.
   (b) Define STACK and write procedures for PUSH and POP operations.
4. (a) What is pars sparse matrix? Write an algorithm for transpose of sparse matrix.
   (b) What is Queue? How is a Queue represented in the memory of a computer?
   Write a procedure for inserting an element NEW into a Queue.
5. (a) Explain Binary tree & Binary Search Tree
   (b) What is spanning tree and what are its advantages.