DIGITAL SYSTEMS AND COMPUTER ORGANIZATION

DCA 2301

SCHOOL OF SCIENCE AND TECHNOLOGY

BANGLADESH OPEN UNIVERSITY

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Digital Systems and Computer Organization
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Preface

In the field of electronic devices, Digital Logic System plays an important role. The rapid development of various areas of digital technology makes it difficult even for a specialist to keep pace with this field. This book provides the reader with a foundation on digital logic systems and digital computer principles. The book emphasizes on operation, behavior and applications of microprocessor and microcomputers. These concepts include microcomputer architecture, memory structure, input/output facility and interfacing. In order to make the text self contained, materials on number systems, Boolean Algebra and required truth table are included.

Unit 1 describes all basic logic gates and Boolean theorems. Several examples are stated here. Combinational logic circuit simplification techniques are described in this unit. The techniques used are Boolean algebra and Karnaugh mapping. One can easily construct a logic circuit from the Boolean algebraic expressions.

Unit 2 explains the fundamental arithmetic operations such as different adder circuits, multiplexer, demultiplexer, decoder and encoder. The construction of LCD and their driving techniques are also illustrated. The practical application of a these combinational circuits are given in this unit.

Unit 3 describes the sequential logic family. The sequential circuits have wide applications in digital systems such as counters, registers, control logic, memories and other complex functions. All of these circuits operations are explained here with examples. The general operation of SR flip flop, J-K filp-flop, D-flop, T-flop are mentioned here which gives an easy understanding for the students.

Unit 4 discusses the functional interrelationship among input, output, the present state and next state etc. of the sequential machine. State diagram and state table are used to analyze the asynchronous and synchronous circuits. The diagram steps of sequential logic circuit are given at the end.

Unit 5 describes the counter and register used in microcomputer. In the digital electronics area one of the important field covers counters and registers. The operational characteristics of various asynchronous and asynchronous counters are explained in this unit. Design techniques of different types of counter with their state table makes it easier to understand the counting process.

Unit 6 describes the memory organization of microcomputer system. Memory terminology, different types of ROM, RAM and their architecture have been added in this unit. The techniques of expanding word size and capacity are illustrated in a lesson.

Unit 7 deals with analog to digital and digital to analog converter. Along with different terminology interfacing with the analog world has been described in this unit. Various D/A and A/D converter circuitry and their operations are described.

Unit 8 covers the design components of microprocessor. This unit analyzes the bus organization. The architecture of 8085 and the description of its registers are also given. Typical microprocessor addressing modes and instruction formats are also given.

Unit 9 discusses parallel processing. First part of the unit presents the classification of parallel processing. One of the important techniques called pipelinning is also described here. Other important parallel processing techniques such as array processor and multiprocessor system are discussed.

At the end of each lesson of the unit there is an exercise. A learner can check his/her understanding of the lesson by answering the questions.