

OBJECTIVE

Identify the functional units in a digital computer system, distinguish between the various ISA styles, trace the execution sequence of an instruction through the processor, compare different approaches used for implementing a functional unit and evaluate different computer systems based on performance metrics.

UNIT – I FUNDAMENTALS OF A COMPUTER SYSTEM 9+3

Functional Units of a Digital Computer – Hardware – Software Interface – Translation from a High Level Language to the Hardware Language – Instruction Set Architecture – Styles and features – RISC and CISC Architectures – Performance Metrics – Amdahl's Law – Case Studies of ISA.

UNIT – II BASIC PROCESSING UNIT 9+3

Components of the Processor – Datapath and Control – Execution of a Complete Instruction – Hardwired and Micro programmed Control – Instruction Level Parallelism – Basic Concepts of Pipelining – Pipelined Implementation of Datapath and Control – Hazards – Structural, Data and Control Hazards – Exception handling.

UNIT – III ADVANCED CONCEPTS IN ILP AND CURRENT TRENDS 9+3

Exploitation of more ILP – Hardware and Software Approaches – Dynamic Scheduling – Speculation – Compiler Approaches – Multiple Issue Processors. – ILP and Thread Level Parallelism – Current Trends – Multicore Processors – Graphics and Computing GPUs.

UNIT – IV ARITHMETIC FOR COMPUTERS 9+3

Addition and Subtraction – Fast Adders – Binary Multiplication – Binary Division – Floating Point Numbers – Representation, Arithmetic Operations.

UNIT – V MEMORY AND I/O 9+3

Need for a hierarchical memory system – Types and characteristics of memories – Cache memories – Improving cache performance – Virtual memory – Memory management techniques – Associative memories – Accessing I/O devices – Programmed Input/Output – Interrupts – Direct Memory Access – Interface circuits – Need for Standard I/O Interfaces like PCI, SCSI, USB.

TOTAL: 45 +15

TEXT BOOK:

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fourth Edition, Morgan Kaufmann / Elsevier, 2009.

REFERENCES:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Sixth Edition, Pearson Education, 2003.
3. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 1998.
4. John L. Hennessy and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fourth Edition, 2007.
5. V.P. Heuring, H.F. Jordan, "Computer Systems Design and Architecture", Second Edition, Pearson Education, 2004.
6. Behrooz Parhami, "Computer Architecture", Oxford University Press, 2007.