2025

COMPUTER SCIENCE — HONOURS

Paper : DSCC-4

(Computer Architecture and Organization)

Full Marks : 75

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer ***any five*** questions : 2×5

(a) Define machine cycle.

(b) What is index register? Explain with proper example.

(c) Mention four important differences between micro-programmed and hardwired control.

(d) Differentiate between memory mapped I/O and I/O mapped I/O.

(e) What is the function of temporary register?

(f) What are the basic differences between a branch instruction, and call subroutine instruction?

(g) What are tri-state devices? Give example and explain its operation.

(h) How many 256 × 8 RAM chips are needed to provide a memory capacity of 2048 bytes? Justify your answer.

Group – A

Answer ***any three*** questions. 5×3

2. Explain the operating principle of IAS computer with block diagram.

3. Explain DMA operation with suitable illustrations.

4. Explain Set Associative mapping in cache memory with appropriate example and illustration.

5. What is software interrupt? What is the difference between maskable and non-maskable interrupt?

6. Write five main differences between Primary and Secondary memory.

Group – B

Answer ***any five*** questions.

7. (a) Explain the arithmetic unit of an ALU capable of subtracting 4-bit numbers using 2's complement method with suitable illustration.

(b) What is the significance of flag registers in determining the results of arithmetic operations, and how do they influence subsequent instructions? 7+3

8. (a) What are the functions of Stack pointer and Program counter registers?

(b) What are the roles of MAR and MDR?

(c) Explain the relationship between the instruction cycle and the machine cycle in computer systems, using neat illustrations. 5+3+2

9. (a) Explain briefly asynchronous data transfer technique.

(b) What constitutes a magnetic hard disk? Describe its fundamental structure. How is information recorded on the disk? Provide a concise explanation. 5+5

10. (a) Explain Programmed mode or Polling techniques used in I/O operations with suitable illustrations.

(b) What is an Interrupt Service Routine (ISR) in microprocessor systems, and what is meant by a vector interrupt? Explain with suitable examples, how ISRs are invoked and how vector interrupts help in identifying the source of an interrupt. 5+5

11. (a) Given the arithmetic expression $(A + B) \times (C - D)$, write the sequence of instructions using;

- Zero-address format (Stack based)
- One-address format (Accumulator based)
- Three address format.

(b) What are the different addressing modes? Give example. 6+4

12. (a) How are optical disks used for data storage and retrieval?

(b) Define cache hit rate and miss penalty and discuss its significance in overall system performance. 5+5

13. (a) Highlight the main differences between ROM and EEPROM.

(b) Compare the relative merits and demerits of CISC and RISC architectures.

(c) What is USB, and why is it widely used as an input/output interface in computer systems? 4+3+3

14. Write short notes on (***any two***) : 5×2

(a) Memory Interleaving

(b) Bus Arbitration

(c) Stack based CPU organization

(d) EEPROM.
