



DIPLOMA UNIVERSITY EXAMINATIONS
SCHOOL OF MANAGEMENT AND LEADERSHIP
DIPLOMA IN INFORMATION COMMUNICATION
TECHNOLOGY

DIT 202: INTRODUCTION TO COMPUTER ORGANISATION

DATE: 7TH APRIL 2026

DURATION: 2 HOURS

**MAXIMUM
MARKS: 70**

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **FOUR** questions.
6. Question **ONE** carries **30 MARKS** and the rest carry **10 MARKS** each.
7. **Write all your answers in the Examination answer booklet provided.**

QUESTION ONE

Read the Case Study below carefully and answer the questions that follow:

The National Revenue Authority is modernizing its core data processing infrastructure to handle a surge in real-time digital tax transactions. The new system is mandated to meet three critical operational requirements: high-speed I/O for instantaneous transaction processing, secure data handling to protect confidential taxpayer information against sophisticated cyber threats, and robust fault tolerance to guarantee 24/7 system availability, even during hardware failures or power outages.

The legacy system, based on a conventional von Neumann architecture with isolated I/O, is no longer sufficient. The IT division must propose a new hardware and architectural strategy that balances performance, security, and reliability while considering integration with existing government databases and future scalability. This case presents a complex challenge in computer system design, requiring a holistic evaluation of memory technologies, I/O schemes, and system architecture.

Required:

- a) Recommend two memory technologies suitable for this system and justify your choices.

(4 Marks)

- b) Explain how interrupt-driven I/O could improve transaction processing efficiency.

(3 Marks)

- c) Suggest one computer architecture for this system and justify your recommendation.

(3 Marks)

- d) How could error detection and correction mechanisms enhance system reliability?

(3 Marks)

- e) Define "Fault Tolerance" in the context of the NRA's system requirements and explain two hardware or architectural features that could be implemented to achieve it.

(4 Marks)

- f) The legacy system uses Isolated I/O. Explain two limitations of this approach for high-speed transaction processing and justify why Memory-Mapped I/O might be a superior alternative for the upgrade.

(4 Marks)

- g) Considering the need for continuous operation, Interrupts will be used to handle urgent system events. Differentiate between a vectored interrupt and a non-vectored interrupt. Which type would be more suitable for the NRA's real-time transaction system and why?

(4 Marks)

- h) Explain the major stages in the instruction cycle, describing the primary activity that occurs at each stage

(5 Marks)

QUESTION TWO

- a) Briefly describe the main technological advancement that characterized each of the first three generations of computers.

(3 Marks)

- b) Describe memory-mapped I/O and isolated I/O. State one advantage of each.

(4 Marks)

- c) Explain the purpose of DMA (Direct Memory Access) and give two examples of devices that commonly use DMA.

(3

Marks)

QUESTION THREE

- a) Explain the concept of cache memory and expound how it improves system performance.

(3

Marks)

- b) Classify the following computers as either general-purpose or special-purpose, giving a reason for each:
- i. Supercomputer used for weather forecasting **(1 Mark)**
 - ii. Embedded controller in a washing machine **(1 Mark)**
 - iii. Personal laptop **(1 Mark)**
- c) Perform binary addition:
 $1101_2 + 1011_2$ Show your working and state the result in decimal.
(4 Marks)

QUESTION FOUR

- a) Briefly explain the boot process stages. **(5 marks)**
- b) Explain instruction pipelining and give two advantages and one Disadvantage of pipelining. **(4 Marks)**
- c) Elaborate the Boolean algebra. **(1 Mark)**

QUESTION FIVE

- a) Identify and explain four features of second-generation computer systems, using examples to support your answer. **(4 Marks)**
- b) Describe three ways computers can be used in government operations, providing real-life examples. **(6 Marks)**

QUESTION SIX

a) With use of examples, expound the three types of computer memory.

(6 Marks

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b) How could error detection and correction mechanisms (e.g., parity bits, CRC) enhance system reliability?

(4 Marks)