Subject Name Solutions

4311602 – Summer 2024

Semester 1 Study Material

Detailed Solutions and Explanations

Question 1(a) [3 marks]

Define Following Term: 1. Data 2. Information 3. Knowledge

Solution

Table 1: Data, Information, and Knowledge Definitions

Term	Definition
Data	Raw facts and figures without meaning or context
Information	Processed data that has meaning and is useful
Knowledge	Information combined with experience and understanding

- **Data**: Basic building blocks without interpretation
- **Information**: Data processed to provide meaningful context
- **Knowledge**: Information enhanced with human insight and wisdom

Mnemonic

"DIK - Data Is Knowledge's foundation"

Question 1(b) [4 marks]

Explain Primary Memory in brief.

Solution

Table 2: Primary Memory Characteristics

Aspect	Description
Definition	Main memory that directly communicates with CPU
Access Speed	Very fast access time
Volatility	Volatile (loses data when power off)
Examples	RAM, Cache memory

- **RAM (Random Access Memory)**: Main working memory for current programs
- **Cache Memory**: Ultra-fast memory between CPU and RAM
- **Volatile Nature**: Data disappears when computer shuts down
- **Direct CPU Access**: CPU can directly read/write data

Mnemonic

"Primary is Fast but Forgetful"

Question 1(c) [7 marks]

Explain types of real time OS with example.

Solution

Table 3: Real-Time Operating System Types

Type	Response Time	Examples	Use Cases
Hard Real-Time	Guaranteed deadline	QNX, VxWorks	Medical devices, Aircraft
Soft Real-Time	Best effort timing	Windows RT, Linux RT	Multimedia, Gaming
Firm Real-Time	Occasional deadline miss	Embedded Linux	Industrial control

Mermaid Diagram (Code)

```
{Shaded}
{Highlighting}[]
graph TD
    A[Real{-Time OS] {-}{-}{} B[Hard Real{-}Time]}
    A {-{-}{} C[Soft Real{-}Time]}
    A {-{-}{} D[Firm Real{-}Time]}
    B {-{-}{} E[Critical Systems]}
    C {-{-}{} F[Multimedia Apps]}
    D {-{-}{} G[Industrial Control]}
{Highlighting}
{Shaded}
```

- **Hard Real-Time**: Missing deadline causes system failure
- **Soft Real-Time**: Delayed response reduces performance but system continues
- **Deterministic Response**: Predictable timing behavior is essential

Mnemonic

"HSF - Hard, Soft, Firm timing requirements"

Question 1(c OR) [7 marks]

Describe Linux architecture and discuss the mode of the operation of Linux

Solution

Linux Architecture Diagram:

Mermaid Diagram (Code)

```
{Shaded}
{Highlighting}[]
graph LR
    A[User Applications] {-{-}{} B[System Libraries]}
    B {-{-}{} C[System Call Interface]}
    C {-{-}{} D[Linux Kernel]}
    D {-{-}{} E[Hardware Layer]}

    subgraph "Kernel Space"
    D
    end

    subgraph "User Space"
    A
    B
    C
    end
{Highlighting}
{Shaded}
```