COMPUTER ORGANIZATION AND ARCHITECTURE

FINAL EXAM

Marking Scheme

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INSTRUCTIONS:

Answer question 1 and any other two questions

Time: 3 Hours

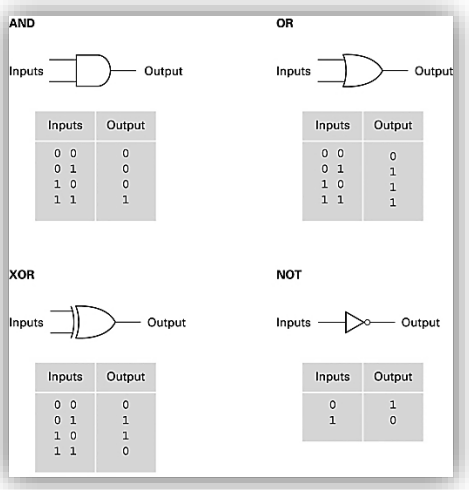
Question 1: Compulsory (30 Marks)

a) Define a computer and list its four main operations. **(5 Marks)**

A programmable, electronic device that accepts data, performs operations on that data, and stores the data or results as needed
Input: Entering data into the computer
Processing: Performing operations on the data
Output: Presenting the results
Storage: Saving data, programs, or output for future use

b) Computer networks can be used to facilitate communication in several ways. Briefly define any four networking applications. **(4 Marks)**
Television and Radio Broadcasting
Global Positioning System (GPS) Applications
Geocaching
Monitoring Systems
Sensor Networks

c) A gate is a device that computes Boolean operations. There are three main basic logic gates that are used. Draw the three gates while providing their input and output truth tables. **(8 Marks)**



d) In programming, running a program is either done using a compiler or an interpreter. Differentiate between the two. **(4 Marks)**

Compiler—utility program translates source code into object code

Interpreter—translation program that does not produce object code—translates one line of source code at a time; executes the translated instruction

e) Differentiate the terms multitasking and multithreading in regards to an operating system **(4 Marks)**

Multitasking provides process and memory management services that allow two or more tasks, jobs, or programs to run simultaneously

Within a single program, multithreading allows multiple parts, or threads, to run simultaneously

f) The boot process is one of the operations of the operations of the Operating Systems. Discuss the process **(5 Marks)**

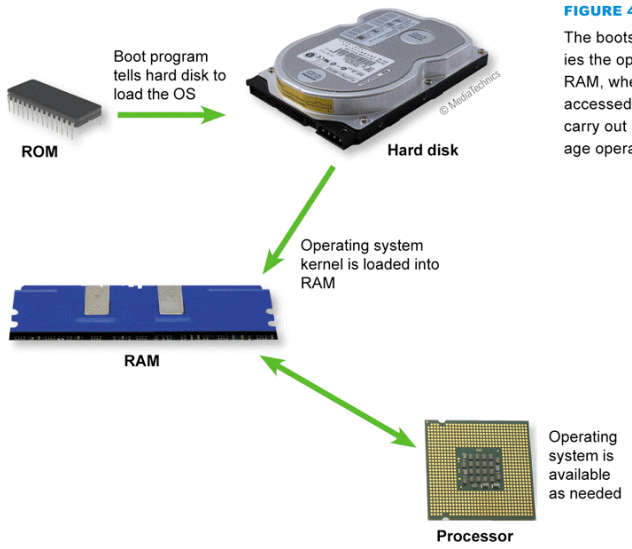


FIGURE 4-6
The bootstrap program copies the operating system into RAM, where it can be directly accessed by the processor to carry out input, output, or storage operations.

ANSWER ANY 2 QUESTIONS FROM THIS SECTION.

Question 2 (15 Marks)

a) Computers have recently seen an improvement in different generations from Manual computers to the present. Discuss the five computer generations listing the uniqueness of each generation. **(10 Marks)**

First Generation of Computers (1946 – 1957)

Were enormous, took up almost entire rooms. They were powered by thousands of Vacuum tubes. They could only solve one problem at a time and needed to be physically re-wired which could take days or weeks to complete. Examples were ENIAC and UNIVAC

Second Generation Computers(1958 - 1963)

This started when the transistors started to replace the vacuum tube. A Transistor is a small device made of semiconductor material that acts like a switch to open or close electronic circuits. Programs and data were input on punch cards and magnetic tape and output was on punch cards and paper print-outs.

Third Generation Computers (1964 - 1970)

Replacement of transistors with integrated Circuits (IC's) marked the beginning of the third generation. Integrated Circuits incorporate many transistors and electronic circuits into a single tiny silicon chip. Punch cards and paper printouts were replaced with keyboards and monitors.

Fourth Generation Computers (1971 – Present)

In this generation there was an increase to the number of transistors on a single chip. This led to the invention of the micro-processor in 1971. A microprocessor contains the core processing capabilities of an entire computer on one single chip. The computers use a keyboard and mouse as well as a monitor, printer and hard drives.

Fifth Generation (Now and the future)

This generation is mainly on infancy stage. There is no precise classification to this generation. The most common attribute though is that they are based on Artificial Intelligence, allowing the computers to think reason and learn.

b) The central processing unit contains some typical components that enable it to perform optimally. Identify and discuss and 5 of them. **(5 Marks)**

Arithmetic/Logic Unit (ALU)

Performs arithmetic involving integers and logical operations

Floating Point Unit (FPU)

Performs decimal arithmetic

Control Unit

Coordinates and controls activities within a CPU core

Prefetch Unit

Attempts to retrieve data and instructions before they are needed for processing in order to avoid delays

Arithmetic/Logic Unit (ALU)

Performs arithmetic involving integers and logical operations

Floating Point Unit (FPU)

Performs decimal arithmetic
Control Unit
Coordinates and controls activities within a CPU core
Prefetch Unit
Attempts to retrieve data and instructions before they are needed for processing in order to avoid delays
Decode Unit
Translates instructions from the Pre-fetch unit so they are understood by the control unit, ALU, and FPU
Registers and Internal Cache Memory
Store data and instructions needed by the CPU
Bus Interface Unit
Allows the core to communicate with other CPU components

Question 3 (15 Marks)

a) Display devices are a type of output hardware. Discuss any 5 characteristics of display devices. **(10 Marks)**

Color vs. Monochrome Displays
Images are formed using pixels
Most displays today are color displays
CRT vs. Flat-Panel Displays
Cathode ray tube (CRT) displays are large, bulky, and heavy
Flat-panel displays take up less desk space and use less power than CRTs
Size and Aspect Ratio
Device size measured diagonally from corner to corner
Screen Resolution
Number of pixels used on a display determines resolution
Video adapters, Interfaces, and Ports
Video cards determine the graphic capabilities of a computer
VGA, DVI, and HDMI are the three most common interfaces to connect monitors to a computer
Wired vs. Wireless Displays
Most monitors are physically connected to the system via a cable (wired)
2D vs. 3D
Most displays are 2D
3D displays use filters, prisms, and multiple lenses to create the 3D effects
Wearable Displays

Project images from a mobile device to a display screen built into glasses
Touch and Gesture Capabilities
Kiosks and portable gaming devices

b) Discuss web-based software while listing one advantage and one disadvantage. **(5 Marks)**

Web-based Software
Is delivered on-demand via the Web
Also called Software as a Service (SaaS) and cloudware
Includes free software and fee-based software
Advantages
Files can be accessed from any computer with an Internet connection
Ease of implementation
Improved collaboration capabilities
Always working with the most current version of software
Potential Disadvantages
Online applications tend to run more slowly
Have file size limits
Cost may eventually exceed the cost of purchasing a similar installed version of the software

Question 4 (15 Marks)

a) Mary is working on some calculations on the computer. The computer however needs to convert everything that Mary does on the background. Mary is performing multiplication of 25 and 15. Show the steps and conversions that the computer would take until it finally displayed the answer to Mary. **(9 Marks)**

Step 1: Convert 25 and 15. **(4 Marks)**
25 – 11001
15 - 1111
Step 2: Multiply the binary digits together. **(3 Marks)**
0101110111
Step 3: Convert the answer back to binary **(2 Marks)**
375

b) There are 3 ways in which data travels. Discuss the three while providing a suitable example. **(6 Marks)**

Simplex Transmission

Data travels in a single direction only. TV Broadcase

Half-Duplex Transmission

Data travels in either direction but only one way at a time. Walkie Talkie

Full-Duplex Transmission

Data travels in both directions, both ways at the same time. Telephone

Question 5 (15 Marks)

a) Each computer fits in one of 6 categories. Discuss any three categories while giving relevant examples. **(6 Marks)**

- **Six basic categories of computers:**
  - **Embedded computers**
  - **Mobile devices**
  - **Personal computers**
  - **Midrange servers**
  - **Mainframe computers**
  - **Supercomputers**

b) In computer ethics, the following terms are used commonly. Define each.

a. Plagiarism **(2 Marks)**

Use of another's ideas, writings, or intellectual property without permission; unethical and illegal

b. Copyright infringement **(2 Marks)**

When copyrighted material is plagiarized

c. Libel **(2 Marks)**

Publication of false statements about a person or business that results in injury to the person or business

c) What is the main difference between RAM and ROM? **(3 Marks)**

Conventional RAM is volatile, which means that programs and documents held in RAM are erased when they are no longer needed by the computer or when the power to the computer is turned off. Storage media, however, are nonvolatile, so the data remains on the media even when the power to the computer or storage device is off. Consequently, storage media are used for anything that needs to be saved for future use