# BCA DEGREE (CBCSS) EXAMINATION, October 2023

Sixth Semester

Bachelor of Computer Applications

Core Course – CA3CRT01 – MICROPROCESSOR AND PC HARDWARE

2017 Admission onwards

C34F06EB

Time: 3 Hours Max. Marks ; 80

# PART A

Answer any six questions. Each question carries 3 marks

1. Define microprocessor

A microprocessor is a processor which incorporates the functions of a CPU on a single integrated circuit (IC).

1. Define instruction cycle

**Instruction cycle** can be defined as the time taken to complete an instruction. An **instruction cycle** is defined as the sequence of operations that are required by the CPU to fetch an instruction and data from the memory and to execute it. The **instruction cycle** consists of a fetch cycle and an execute cycle.

1. What is an instruction.

An instruction is a command to the microprocessor to perform a given task on a

specified data. Each instruction has two parts: one is task to be performed, called

the operation code (opcode), and the second is the data to be operated on, called

the operand.

1. Explain instruction format of 8085

The instruction format of 8085 consists of one, two and three byte instructions. The first byte is always the opcode; in two byte instructions the second byte is usually data; in three byte instructions the last two bytes present address or 16-bit data.

1. What is the use of branching instruction? Give an example

The branching instruction alter the normal sequential flow. These instructions alter either unconditionally or conditionally

1. Define motherboard

The motherboard serves as a single platform to connect all of the parts of a computer together. It connects the CPU, memory, hard drives, optical drives, video card, sound card, and other ports and expansion cards directly or via cables. It can be considered as the backbone of a computer.

1. What is processor bus

A processor bus, also known as the front-side bus, refers to a specific electrical connection within a computer that connects a computer's processor to a chip known as the north bridge.

1. How can we select a motherboard.

When selecting a motherboard, check the following component

· Processor

· Cache memory

· Form factor

· Motherboard chipset

· BIOS

· Motherboard speed

· Processor socket

· Bus Type

· DIMM memory

**(Give full marks if any four are written)**

1. What is meant by recording media of a disk

Recording media means any removable, physical audio recording medium (such as magnetic tape, optical disc or solid state memory) which can be played and copied.

1. What is the function of logic board of HDD

Hard drives have two kinds of components: internal and external. External components are located on a printed circuit board called logic board.

1. What is NTFS?

NTFS (New Technology File System) Structure -.

· Used by Windows NT, XP, 2000, Server 2003, Server 2008, Windows Vista.

· NTFS provides better performance, security compatibility and extendibility than FAT

· Read, Search, Write, Recovery are done fast. Master File Table (MFT) contain information about all files and folders.

1. Compare extended and expanded memory

Memory addresses greater than or equal to one megabyte are called extended memory. Expanded memory is addressed from within the lower 1MB space, usually above 640K.

PART B

Each question carries 5 Marks

1. What is maskable and non-maskable interrupts? Explain with example

Maskable Interrupts are those which can be disabled or ignored by the microprocessor.

· These interrupts are either edge-triggered or level-triggered, so they can be disabled.

· INTR, RST 7.5, RST 6.5, RST 5.5 are maskable interrupts in 8085 microprocessor.

· Non-Maskable Interrupts are those which cannot be disabled or ignored by microprocessor.

· TRAP is a non-maskable interrupt.

· It consists of both level as well as edge triggering and is used in critical power failure conditions.

1. Explain hardware and software interrupts

When microprocessors receive interrupt signals through pins (hardware) of microprocessor, they are known as Hardware Interrupts.

· There are 5 Hardware Interrupts in 8085 microprocessor.

They are

INTR, RST 7.5, RST 6.5, RST 5.5, TRAP

· Software Interrupts

which means these are mnemonics of microprocessor.

· There are 8 software interrupts in 8085 microprocessor.

They are

RST 1, RST 2, RST 3, RST 4, RST 5, RST 6, RST 7

1. Define addressing mode and describe the addressing modes of intel 8085

Addressing Modes– The term addressing modes refers to the way in which the operand of an instruction is specified. The addressing mode specifies a rule for interpreting or modifying the address field of the instruction before the operand is actually executed.

**Types of Addressing Modes**

**In 8085 microprocessor there are 5 types of addressing modes:**

1. Immediate Addressing Mode: In immediate addressing mode the source operand is always data. If the data is 8-bit, then the instruction will be of 2 bytes, if the data is of 16-bit then the instruction will be of 3 bytes.

Examples: MVI B 45 (move the data 45H immediately to register B)

ADI 06(Add 06 to the content of accumulator) JMP address (jump to the operand address immediately)

1. Register Addressing Mode: In register addressing mode, the data to be operated is available inside the register(s) and register(s) is(are) operands.

Therefore the operation is performed within various registers of the microprocessor.

Examples: MOV A, B (move the contents of register B to register A)

ADD B (add contents of registers A and B and store the result in register A)

INR A (increment the contents of register A by one)

1. Direct Addressing Mode: In direct addressing mode, the data to be operated is available inside a memory location and that memory location is directly specified as an operand. The operand is directly available in the instruction itself.

Examples: LDA 2050 (load the contents of memory location into accumulator A) LHLD address (load contents of 16-bit memory location into H-L register pair)

1. Register Indirect Addressing Mode: IN register indirect addressing mode, the data to be operated is available inside a memory location and that memory location is indirectly specified by a register pair.

Examples: MOV A, M (move the contents of the memory location pointed by the H-L pair to the accumulator) LDAX B (move contains of B-C register to the accumulator) LXIH 9570 (load immediate the H-L pair with the address of the location 9570)

1. Implied/Implicit Addressing Mode: In implied/implicit addressing mode

the operand is hidden and the data to be operated is available in the instruction itself.

Examples: CMA (finds and stores the 1’s complement of the contains of accumulator A in A) RRC (rotate accumulator A right by one bit)

RLC (rotate accumulator A left by one bit)

1. What is meant by co-processor? Explain with an example

It is a special purpose microprocessor which is used to speed up main processor job by taking over some of the main processor’s work.

Example: Math Coprocessor.

1. What is the importance of BIOS in booting procedure.

Basic Input Output System. BIOS program lets the application programs and hardware communicate with each other. It also contains a program called POST (Power on Self Test). This program checks the motherboard and other devices connected to the computer during the system power-on time.

BIOS or Basic Input Output System, is a program stored inside a ROM chip on a computer. This program lets the operating system and computer hardware communicate with application programs and peripheral devices. BIOS is a set of instructions stored in PROM. So BIOS is not a complete hardware or software, and it is termed as a firmware. [Firmware is software stored inside ROM or EPROM].

The computer and the user program and the BIOS communicate with each other using interrupts. Whenever the computer has to request something from the user, computer generates an interrupt, and the BIOS will carry out a particular task according to the interrupt number. These are software interrupts.

When an interrupt is received, the BIOS will search the interrupt vector table (IVT) for the address of the required service to the interrupting program. Once the address is found, BIOS starts execution of the interrupt service routine; a program that provides the requested service to the interrupting program. After finishing the interrupt service routine, the BIOS will return back to the old process that initiated the interrupt.

1. POST [Power On Self Test]: POST is a set of diagnostic programs loaded from the BIOS ROM during the system power on time. This program ensures that all the major system components are present and are working properly.

This program checks the processor, memory, support circuits and other devices connected to the computer when the computer is first powered on. If this routine finds any error, the error, depending on its severity, is informed to the user as a beep sound or some error message on the screen. Some errors called nonfatal errors, allow user to continue, whereas fatal errors will not allow the POST to continue until the problem is rectified.

2. Bootstrap Loader: It is the job of the bootstrap loader to load the operating system from the hard disk into the computer’s main memory. Unless the boot process is successfully completed, user cannot use the computer. A successful transfer of the OS to RAM is indicated as A:\> or C:\>.

1. Briefly explain about chipset and super I/O chip

Intel 850 Chipset is designed with the Intel Pentium 4 processor and Intel Netburst Micro Architecture. The length of the pipeline between the processor and the chipset is doubled. 400 Mhz System Bus Advanced Dynamic Execution accurately predict branch utilization.

Execution Trace Cache stores decoded instructions and removes the decoder from the main instruction loop.

Features:

· 82850 MCH 615 Organic Land Grid Array(OLGA)

· 82801 BA ICH 360 Enhanced Ball Grid Array(EBGA)

· Dual RDRAM Memory channels. AGP4X Interface.

· Two USB Controllers. The latest AC’97 audio.

· LAN Connect Interface(LCI) Dual Ultra ATA/100 controllers

· Communication and Network Riser (CNR).

**Super I/O Chips**

Super I/O chip is a chip that integrates devices formerly found on separate expansion cards in older systems. Most super I/O chips contain at a minimum the following components.

· Floppy Controller

· One or two serial port controllers

· Parallel port controller.

The floppy controllers on some Super I/O chips handle two drives, but newer models can handle only one. Most of the better super I/O chips implement a buffered serial port design known as Universal Asynchronous Receiver Transmitter, one for each port. Virtually, all Super I/O chips also include a high speed multi-mode parallel port. Most recent models allow three models; standard (bidirectional), Enhanced Parallel Port (EPP)and the Enhanced Capabilities Port (ECP).

1. Briefly explain the harddisk operation

The basic physical construction of a hard disk drive consists of spinning disks with heads that move over the disks and store data in tracks and sectors. The heads read and write data in concentric rings called tracks, which are divided into segments called sectors, which typically store 512 bytes each (see Figure below)



Hard disk drives usually have multiple disks, called platters, that are stacked on

top of each other and spin in unison, each with two sides on which the drive

stores data. Most drives have two or three platters, resulting in four or six sides,

but some PC hard disks have up to 12 platters and 24 sides with 24 heads to read them.

The identically aligned tracks on each side of every platter together make up a

cylinder (see Figure below).



A hard disk drive usually has one head per platter side, with all the heads mounted on a common carrier device or rack. The heads move radially across the disk in unison; they can't move independently because they are mounted on the same carrier or rack, called an actuator.

The heads in most hard disk drives do not (and should not!) touch the platters during normal operation. However, on most drives, the heads do rest on the platters when the drive is powered off. In most drives, when the drive is powered off, the heads move to the innermost cylinder, where they land on the platter surface. This is referred to as contact start stop (CSS) design. When the drive is powered on, the heads slide on the platter surface as they spin up, until a very thin cushion of air builds up between the heads and platter surface, causing the heads to lift off and remain suspended a short distance above or below the platter. If the air cushion is disturbed by a particle of dust or a shock, the head can come into contact with the platter while it is spinning at full speed. When contact with the spinning platters is forceful enough to do damage, the event is called a head crash. The result of a head crash can be anything from a few lost bytes of data to a completely ruined drive. Most drives have special lubricants on the platters and hardened surfaces that can withstand the daily "takeoffs and landings" as well as more severe abuse.

1. Compare and contrast FAT and FAT32

FAT (File Allocation Table) is a file system used on computers. Its function is to map out which areas of the drive are unused and which areas of the drive contain files. A file system is very important as it facilitates the seamless reading and writing files to the drive. FAT32 is just one of the variants of FAT that appeared as it evolved to adapt it to the increasing requirements of computing. It is the latest and most widely used in the succession of FAT variants.

FAT32 uses 32 bits to represent each cluster value. The more notable FAT variant that preceded FAT32 commonly known as FAT16, uses 16 bits. FAT32 can have partitions of upto 2TB or 200GB .FAT32 also has a 4GB limit to the size of individual files.

1. Write a note on extended memory

The memory above 1 MB area is called extended memory.

· It is used for programs and data when using an operating system running in protected mode.

· This memory is available from addresses 10FF0H to the last memory location.

With the minor exception of the High Memory Area (HMA), extended memory can be addressed only by applications run in real mode. It is possible, however, for DOS applications to make use of this memory to store data (but not to execute code directly from there). XMS (eXtended Memory Standard, promulgated by Microsoft) permits applications to allocate extended memory and takes care of copying data to and from extended memory and conventional memory so that the application does not have to worry about switching between modes. Like EMS, XMS usually requires loading a device driver of some sort. Extended memory is limited to 15Mb on 286es and 386SXes (15Mb extended plus 1Mb conventional and upper memory equals 16Mb, or 224, 24 being the number of address lines coming out of the CPU), limited to 4 gigabytes (232) for 386DX chips and up, although very few motherboards have been designed to hold that much memory.

PART C

Answer any two questions

Each question carries 15 Marks

1. Draw the block diagram and explain the components of Intel 8085

The internal architecture of 8085 includes the ALU, timing and control

unit, instruction register and decoder, register array, interrupt control and

serial I/O control.

The main heart of microprocessor is CPU.

CPU comprises of ALU, timing and control unit, instruction register and

decoder, register array, interrupt control and serial I/O control.

*(Give 9 marks for the detailed explanation and 6 marks for the correct diagram)*



1. Write note on (a) ISA (b) EISA (c) MCA
2. Give 5 marks

The ISA Bus [Industry Standard Architecture]: ISA provided reliability, affordability and compatibility and is faster than many other devices connected to it.

8-Bit ISA: This Bus architecture is used in the original IBM PC computers. The 8-bit ISA expansion slot is specifically called a card/edge connector; an adapter card with 62 contracts on its bottom plugs into a slot on the motherboard that has 62 matching contacts. Electronically, this slot provides 8 data lines and 20 address lines, enabling the slot to handle 1 MB of memory.

16-Bit ISA: With the introduction of 286, IBM introduced a system that could support both 8 and 16 bit cards by retaining the same basic 8-bit connector layout but adding an optional 16- bit extension connector. The extension connector in each 16-bit expansion slot adds 36 connector pins (98 signals) to carry the extra signals necessary to implement the wider data path.

In addition, two of the pins in the 8-bit portion of the connector were changed. These two minor changes did not alter the function of the 8-bit card.

b) Give 5 marks

**The EISA Bus [Extended Industry Standard Architecture]:** The EISA bus was essentially a 32 bit version of ISA. It added 90 new connections (55 new signals plus ground) without increasing the physical connector size of the 16-bit ISA slot. The EISA adapter has two rows of stacked contacts. The first row is the same type used in 16 bit ISA cards; the other thinner row extends from the 16 bit connector. So ISA cards can still be used in EISA bus slots. The EISA bus can handle up to 32 bits of data at an 8.33MHz cycle rate.

c) Give 5 marks

Micro Channel architecture is a 16- or 32-bit parallel computer bus introduced by IBM in 1987 which was used on PS/2 and other computers until the mid-1990s. Its name is commonly abbreviated as "MCA", although not by IBM. In IBM products, it superseded the ISA bus and was itself subsequently superseded by the PCI bus architecture.

1. Explain the different components of HDD

The hard disk is a type of magnetic disk. It is also called a fixed disk because it is fixed in the system unit. A hard disk consists of several circular disks called platters sealed inside a container. The container contains a motor to rotate the disk. It also contains an access arm and read and write head to read and write data to the disk. The platters are used to store the data. A platter in a hard disk is coated with magnetic material.

The hard disk used in computers spin at the speed of 5400 to 15000 evolutions per minute. The speed at which the disk spins is a major factor in its overall performance. The high rotational speed allows more data to be recorded on the disk surface.

· Actuator that moves the read-write arm. In older hard drives, the actuators were stepper motors. In most modern hard drives, voice coils are used instead. As their name suggests, these are simple electromagnets, working rather like the moving coils that make sounds in loudspeakers. They position the read-write arm more quickly, precisely, and reliably than

stepper motors and are less sensitive to problems such as temperature variations.

· Read-write arm swings read-write head back and forth across platter.

· Central spindle allows platter to rotate at high speed.

· Magnetic platter stores information in binary form.

· Plug connections link hard drive to circuit board in personal computer.

· Read-write head is a tiny magnet on the end of the read-write arm.

· Circuit board on underside controls the flow of data to and from the platter.

· Flexible connector carries data from circuit board to read-write head and platter.

· Small spindle allows read-write arm to swing across platter.

(Give marks for detailed explanation of at least 5 components)

1. Discuss about each one (a) Conventional Memory (b) UMA (c) HMA
2. Give 5 marks

The first 640 KB of system memory is called Conventional Memory.

· Conventional Memory is also called as Base Memory.

· This area available for use by standard DOS programs, along with many

drivers, memory-resident programs, and most anything else that has to run

under standard DOS.

· Conventional Memory occupies addresses 00000h to 9FFFFh.

· The bottom 1k area is used to store DOS interrupt vector pointers.

1. Give 5 marks

The upper 384 KB of the first megabyte of system memory just above the Conventional Memory is called as upper memory area.

· Function of UMA is ROM shadowing(ROM shadowing is where the contents of the ROM (Read Only Memory, or Firmware) for a device is copied into the computer RAM (Random Access Memory) and is accessed from there.) and loading drivers.

1. Give 5 marks

The first 64 KB of extended memory are termed as HMA.

· It can accessed also when the processor is in real mode.

· It is usually used for DOS.

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