SCHEME OF VALUATION

(Scoring Indicators)

Revision:2015

Course Code: TED (15) 4131

Course Title: COMPUTER SYSTEM HARDWARE

Qst No	Scoring Indicators	Split up score	Sub Total	Total
I. 1)	**PART A** • Monitor • Graphic Plotter • Printer • Speaker	Half mark each 0.5*4=2	2	2
I. 2)	Power On Self-Test. Post is a series of system checks performed by the system bios. Post routine verifies the integrity of the bios itself. it verifies and confirms the size of primary memory. during post, the bios also analyses various hardware, such as buses and boot devices.	Full form 1 mark. Defn-1 mark	1+1	2
I. 3)	Serial Advanced Technology Attachment is a computer bus interface that connects host bus adapters to mass storage devices such as hard disk drives, optical drives, and solid-state drives.	Full form 1 mark. Defn-1 mark	1+1	2
I. 4)	A thin client is a lightweight computer that is purpose-built for remoting into a server (typically cloud or desktop virtualization environments). It depends heavily on another computer (its server) to fulfil its computational roles. This is different from a conventional desktop PC (thick client), which is a computer designed to take on these roles by itself.	2	2	2
I. 5)	1.Slate style tablets 2. Convertible tablets 3. Hybrid tablets 4. Rugged tablets	Half marks each	½*4	2

II.1)	Components of Mother board • Chipsets • Expansion slots and buses • Memory slots and external cache • CPUs and their sockets • Power connectors • Onboard disk drive connectors • Keyboard connectors • Integrated peripheral ports and headers • BIOS/firmware • CMOS battery • Jumpers and DIP switches • Front-panel connectors	(Any three) explanation	3*2=6	6
II.2)	▪ SIMM ▪ DIMM ▪ RIMM ▪ SODIMM ▪ MicroDIMM	(Any three) explanation	3*2=6	6
II.3)	RAID stands for Redundant Array of Independent Disks. It is a way of combining the storage power of more than one hard disk for a special purpose, such as increased performance or fault tolerance. RAID can be implemented in software or in hardware There are several types of RAID. The following are the most commonly used RAID levels: RAID 0 (also known as stripe set or striped volume) splits data evenly across two or more disks with no redundancy Here data is written across multiple drives, so one drive can be reading or writing while the next drive's read-write head is moving. This makes for faster data access. However, if any one of the drives fails, all content is lost. RAID 1 is also known as disk mirroring. RAID 1 is a method of producing fault tolerance by writing all data simultaneously to two separate drives. If one drive fails, the other contains all the data and will become the primary drive. However, disk mirroring doesn't help access speed, and the cost is double that of a single drive. RAID 2, which is rarely used in practice, stripes data at the bit (rather than block) level, and uses a Hamming code for error	Any six	6*1=6	6

	correction. The disks are synchronized by the controller to spin at the same angular orientation, so it generally cannot service multiple requests simultaneously. RAID 3 consists of byte-level striping with a dedicated parity disk. It cannot handle multiple requests simultaneously. It is used for applications that have long sequential data transfers, such as streaming media, graphics and video editing. RAID 4 consists of block-level striping with a dedicated parity disk. As a result of its layout, RAID 4 provides good performance of random reads, while the performance of random writes is low due to the need to write all parity data to a single disk RAID 5 combines the benefits of both RAID 0 and RAID 1, creating a redundant striped volume set. Unlike RAID 1, however, RAID 5 does not employ mirroring for redundancy. Each stripe places data on n-1 disks, and parity computed from the data is placed on the remaining disk. The parity is interleaved across all the drives in the array so that neighbouring stripes have parity on different disks. If one drive fails, the parity information for the stripes that lost data can be used with the remaining data from the working drives to derive what was on the failed drive and rebuild the set once the drive is replaced. RAID 6 extends RAID 5 by adding another parity block; thus, it uses block-level striping with two parity blocks distributed across all member disks.			
II.4)	**Purpose and characteristics of Storage devices** A storage device is any computing hardware that is used for storing, porting and extracting data files and objects. Different types of storage differ in terms of their - capacity (how much they can store) - access time (how fast the computer can access the information) - physical type of media used -	3*2	3*2=6	6

II.5)	• Video • Multimedia • I/O • Communications	Any three explanation (3*2)	3*2=6	6
II.6)	**Docking Stations** A docking station is basically an extension of the motherboard of a laptop. A docking station is designed to stay behind when the laptop is removed, it can contain things like a full-sized drive bay and expansion bus slots. Also, the docking station can function as a port replicator. It contains ports so that peripherals such as monitors, keyboards, printers, and so on that don't travel with the laptop can remain connected to the dock and don't have to all be physically unplugged each time the laptop is taken away. A docking station is connected to the laptop through a proprietary docking port.	Explanation	6	6
II.7)	**Laptop vs. Desktops** **Portability** – Laptops are portable – run on batteries – can connect to networks wirelessly. **Cost** – Laptop components are smaller and have unique proprietary designs – so cost is high. **Performance** – Compromises made to reduce size results in reduction in performance. **Expandability** – It is difficult to upgrade laptop components especially motherboard and processor. **Quality of Construction** - the materials used to construct the laptop case and other components are extremely durable	Any four 4*1.5	4*1.5=6	6

III a)	**Varieties of RAM** 1) DRAM i. Asynchronous DRAM a) FPM DRAM b) EDO DRAM c) BEDO DRAM ii. Synchronous DRAM a) SDR SDRAM b) DDR SDRAM c) DDR2 SDRAM d) DDR3 SDRAM e) DRDRAM 2) SRAM	Explanation of each (1*9)	9	9
III b)	**Chipsets** A chipset is a collection of chips or circuits that perform interface and peripheral functions for the processor. This collection of chips is usually the circuitry that provides interfaces for memory, expansion cards, and onboard peripherals and generally dictates how a motherboard will communicate with the installed peripherals. Chipsets are usually given a name and model number by the original manufacturer. Chipsets can be made up of one or several integrated circuit chips. The functions of chipsets can be divided into two major functional groups, called Northbridge and Southbridge. **Northbridge** Northbridge subset of a motherboard's chipset is the set of circuitry or chips that manages high-speed peripheral communications. The Northbridge is responsible primarily for communications with integrated video using AGP and PCIe, for instance, and processor-to-memory communications. The communications between the CPU and memory occur over what is known as the front side bus (FSB), which is just a set of signal pathways connecting the CPU and main memory. The backside bus (BSB), if present, is a set of signal pathways between the CPU and Level 2 or 3 (external) cache memory. If no backside bus exists, cache	3 marks	3+3=6	6

	is placed on the front side bus with the CPU and main memory. The Northbridge is directly connected to the Southbridge. It controls the Southbridge and helps to manage the communications between the Southbridge and the rest of the computer. **Southbridge** The Southbridge subset of the chipset is responsible for providing support to the onboard slower peripherals (PS/2, parallel ports, serial ports, Serial and Parallel ATA, and so on), managing their communications with the rest of the computer and the resources given to them.	3 marks		
IV a)	1. Hyperthreading This term refers to Intel's Hyper-Threading Technology (HTT). HTT is a form of simultaneous multithreading (SMT). It allows processors to execute multiple instructions operating on separate data in parallel. HTT-capable processors appear to the operating system to be two processors. 2. Multicore A processor that exhibits a multicore architecture has multiple completely separate processor dies in the same package. Dual-core and quad-core processors are common specific examples of the multicore technology. 3. Throttling CPU throttling allows reducing the operating frequency of the CPU during times of less demand or during battery operation. CPU throttling is very common in processors for mobile devices, where heat generation and system-battery drain are key issues of full power usage. 4. Speed The speed of the processor is generally described in clock frequency (MHz or Ghz). 5. 32- and 64-bit processors	Any Six Characteristics	6*1=6	6

	The set of data lines between the CPU and the primary memory of the system can be 32 or 64 bits wide. The wider the bus, the more data that can be processed per unit of time, and hence, more work can be performed. 6. Virtualization support CPU virtualization involves a single CPU acting as if it were two separate CPUs. In effect, this is like running two separate computers on a single physical machine. VMware and Xen are two well-known virtualization software. 7. Integrated GPU Some CPUs have built-in graphics processing units (GPUs). Integrated GPUs take much of the burden off of the CPU itself in addition to minimizing the amount of off-package communication that must occur, which improves overall system performance.			
IV b)	**POST** – Test the computer hardware and make sure no errors exist before loading the operating system. **Bootstrap Loader** – Locate the operating system. If a capable operating system is located, the BIOS will pass control to it. **BIOS drivers** – Low level drivers that give the computer basic operational control over your computer's hardware. **BIOS or CMOS Setup** – Configuration program that allows you to configure hardware settings including system settings such as computer passwords, time, and date	4*1.5	4*1.5=6	6
V a)	**Power Connectors** Power connectors coming out of power supplies are of different types **1. Classic power connectors** The classic connectors comprise outdated connectors as well as connectors still in use. They are			

	AT System Connector The original power connectors attached to the early PC motherboards were known collectively as the AT system connector. There are two six-wire connectors, labelled P8 and P9. They connect to an AT-style (AT, Baby AT and LPX) motherboard and deliver the power that feeds the electronic components on it. They are connected together to the 12-pin receptacle on the motherboard. **Standard Peripheral Power Connector** The standard peripheral power connector is a 4-pin connector, generally used to power different types of internal disk drives (Hard disk and CD drive). This type of connector is also called a Molex connector. **Floppy Drive Power Connectors** Floppy drive power connectors are most commonly used to power floppy disk drives and other small form factor devices. This type of connector is smaller and flatter than any of the other types of power connectors. These connectors are also called Berg connectors. There are four wires going into this connector. These wires carry the two voltages used by the logic circuits and motors: +5VDC (carried on the red wire) and +12VDC (carried on the yellow wire), respectively; the two black wires are ground wires. **2. Modern Power Connectors** In modern systems, Molex and Berg connectors are present. But P8 and P9 connectors are replaced by new connectors. **ATX, ATX12V and EPS12V Connectors** The ATX motherboard power connector provides six voltages through a single 20-pin connector. These different	1 mark 1 mark 1 mark 2 marks	1+1+1+ 2*3=9	9

voltages are required for the working of the motherboard and its peripherals—such as network interfaces, PCIe cards, and the CPU.

PWR ON – Power On is a signal from the motherboard to the power supply. When the line is connected to ground (by the motherboard), the power supply turns on.

PWR Good – Power Good is an output from the power supply that indicates that it's output is stable and is ready for use.

+5V SBY - +5V Standby supplies power even when the rest of the supply wire lines are off. Used to power the circuitry that controls the Power On signal.

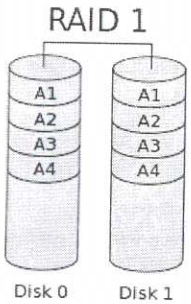
When Pentium 4 processor was introduced, it required much more power. For this purpose a new **ATX12V 1.0** standard was introduced. It included two connectors – a 6-pin connector (**ATX Auxiliary Power Connector**) that supplied +3.3V and +5V leads and their grounds and a 4-pin connector (referred to as a **P4 connector)** that provides two +12V leads and their grounds. **EPS12V** uses an 8-pin version, called the **processor power connector** that doubles the P4's function with four + 12V leads and four grounds.

For servers and more advanced ATX motherboards that include PCIe slots, the 20-pin system connector proved inadequate. This led to the ATX12V 2.0 standard which provides a 24-pin connector.

ATX12V 2.1 introduced a different 6-pin connector which was specifically designed to give additional dedicated power to PCIe adapters that required it. It provided a 75W power source to such devices. ATX12V 2.2 replaced the 75W 6-pin connector with a 150W 8-pin connector.

Proprietary Power Connectors

	Apart from the above connectors, the manufacturers of different motherboards may use their own power connector types which may make it impossible to replace faulty connectors with other available ones. **SATA Power Connectors** The 15-pin SATA power connector is made up of three +3.3V, three +5V, and three +12V leads and two sets of three ground leads. Each of the five sets of three common pins is supplied by one of five single conductors coming from the power supply	2 marks 2 marks		
V b)	**SCSI Drives** Small Computer System Interface (SCSI) is a set of standards for physically connecting and transferring data between computers and peripheral devices. The SCSI standards define commands, protocols, electrical and optical interfaces. SCSI is most commonly used for hard disk drives and tape drives, but it can connect a wide range of other devices including scanners and CD drives. SCSI has three basic specifications: SCSI-1 has a bus width of 8 bits and a clock speed of 5MHz. SCSI-2 included the Common Command Set (CCS) which has 18 commands that are needed to support any SCSI device. It has a bus width of 16 bits and clock speed of 10 MHz. SCSI 3 supports more devices on a bus (upto 32) and provided faster data transfer rates. To configure SCSI, you must assign a unique device number (often called a SCSI address, SCSI ID, or SCSI device ID) to each device on the SCSI bus. These numbers are configured through jumpers, DIP switches, and up/down pushbuttons with the selected ID displayed through a hole on a wheel, among other ways. When the SCSI controller needs to send data to the device, it activates the wire dedicated to signaling that address. A device called a terminator (technically a terminating resistor pack) must be installed at both ends of the bus to keep the signals "on	6	6	6

	the bus." The device then responds with a signal that contains the number of the device that sent the information and the data itself.			
VI a)	To create a partition or on a hard disk, there must be either unallocated (empty) space on the hard disk or free space within an extended partition on the hard disk. If there is no unallocated space, you can create some by shrinking an existing partition, deleting a partition, or by using a third-party partitioning program. **To create and format a partition (volume):** Open Computer Management by clicking the Start button, clicking Control Panel, clicking System and Maintenance, clicking Administrative Tools, and then double-clicking Computer Management. 1. In the Navigation pane, under Storage, click Disk Management 2. Right-click an unallocated region on your hard disk, and then click New Simple Volume. 3. In the New Simple Volume Wizard, click Next. 4. Type the size of the volume you want to create in megabytes (MB) or accept the maximum default size, and then click Next. 5. On the Assign Drive Letter Or Path page, specify whether you want to assign a drive letter or path and then click Next. 6. Use the Format Partition page to determine whether and how the volume should be formatted. If you want to format the volume, choose Format This Volume 7. Click Next, confirm your options, and then click Finish.	9	9	9
VI b)	In data storage, **disk mirroring** is the replication of logical **disk** volumes onto separate physical hard**disks** in real time to ensure continuous availability. It is most commonly used in RAID 1. A **mirrored** volume is a complete logical reepresentation of separate volume copies.  	2*3=6	6	6

	Disk duplexing is a variation of disk mirroring in which each of multiple storage disks has its own SCSI controller. The use of redundant controllers enables continued data access as long as one of the controllers continues to function. Another benefit of disk duplexing is increased throughput. Using a technique known as a *split seek*, whichever disk can deliver the requested data more quickly responds. Multiple requests may also be split between the disks for simultaneous processing			
VII a)	**Characteristics of Connectors and Cables** Any connector on a computer or peripheral into which a cable can be plugged is called a ***port***. A cable is a way of connecting a peripheral or other device to a computer. Simply, a cable connects two ports. Cables contain multiple copper or fibre-optic conductors inside a common wrapping or sheath. Common types of peripheral ports are 1. D-subminiature 2. RJ-series 3. Other types **D-subminiature Connectors** They are the most common types of connectors. They are designated as DXn where X – represents the size of the connector (replaced by A-E) n – number of pins D-sub connectors are usually shaped like a trapezoid with at least two rows of pins. They can be either male or female connectors. Examples are DE15F video port, DB25F printer port and DE9M serial port **RJ Series**	2 marks	2+2+5=9	9

	Registered Jack (RJ) connectors are commonly used in telecommunications. Two most common types are RJ-11 and RJ-45. RJ-11 is used with telephone jacks and analog modems. RJ-45 connectors are commonly found on Ethernet networks that use twisted-pair cabling. Ethernet interfaces have 8 pins. **Other types of ports** • Universal Serial Bus (USB) • IEEE 1394 (FireWire) • Infrared • Audio jacks • PS/2 (mini-DIN) • Centronics **Universal Serial Bus (USB)** They are used for connecting multiple (up to 127) peripherals to one computer through a single port. USB version 1.x supports data rates as high as 12Mbps (1.5MBps). USB 2.0 supports data rates as high as 480Mbps (60MBps). USB 3.0 supports data rates of 5Gbps. They have higher transfer rate, flexibility and ease of use. **Firewire (IEEE 1394)** FireWire is Apple's name for the IEEE 1394 High Speed Serial Bus. Used to transfer digital video into PC. High power output – so there is no need for an external power supply for security cameras. Ease of use and 400Mbps – 3.2 Gbps speed. **Infrared** An infrared (IR) port is a small port on the computer that allows data to be sent and received using electromagnetic radiation in the infrared band. The infrared port is a small, dark square of plastic (usually a very dark maroon) and can typically be found on the front of a PC or on the side of a laptop or	2 marks 5 marks		

	portable. The main disadvantages of IR are - IR is a line-of-sight communication and take place within a short distance and is blocked by obstacles. - Low transmission rate (maximum 4Mbps) Due to these, IR is replaced by Bluetooth and Wi-Fi in newer machines. **Audio/Video Jacks** RCA jacks were developed by the RCA (Radio Corporation of America) Victor Company. They are used to transmit both audio and video information. **PS/2 (Keyboard and Mouse)** A PS/2 port (also known as a mini-Din 6 connector) is a mouse and keyboard interface port first found on the IBM PS/2. It was smaller than the previous interfaces used for keyboard and mouse. Typically the keyboard port is purple and mouse port is green. **Centronics** It consists of a central connection bar surrounding by an outer shielding ring. The centronics connector was primarily used in parallel printer connections and SCSI interfaces. It is most often found on peripherals, not on computers themselves.			
VII b)	**Display Types** 1) CRT 2) Liquid crystal display 3) LED displays 4) Plasma 5) OLED 6) Projection systems (Any Two display type explanation)	(2* 3=6)	6	6

VIII a)	**Laser Printers** Laser printers use an electrostatic digital printing process. It is called **electrophotographic (EP) print process.** It uses a laser to scan the image onto a photosensitive drum. This technology uses a combination of static electric charges, laser light, and a black powdery ink-like substance called **toner.** **Basic components** 1. Toner Cartridge 2. . The Laser Scanning Assembly 3. High-Voltage Power Supply (HVPS) 4. DC Power Supply (DCPS) 5. Paper-Transport Assembly 6. The Transfer Corona Assembly 7. Fusing Assembly 8. Printer Controller Circuitry 9. Ozone filter 10. Duplexing Assembly **Electrophotographic (EP) Print Process** 1. Cleaning 2. Charging 3. Writing (exposing) 4. Developing 5. Transferring 6. Fusing **1. Cleaning** A rubber blade inside the EP cartridge scrapes any toner left on the drum into a used toner receptacle inside the EP cartridge, and a fluorescent lamp discharges any remaining charge on the photosensitive drum. **2. Charging** A special wire or roller (called a charging corona) within the EP toner Cartridge (above the photosensitive drum) gets a high voltage from the HVPS. It uses this high voltage to apply a	3 marks 6 marks	3+6=9	9

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	strong, uniform negative charge (around –600VDC) to the surface of the photosensitive drum **3. Writing** In this step, the laser is turned on and scans the drum from side to side, flashing on and off according to the bits of information the printer controller sends it as it communicates the individual bits of the image. Wherever the laser beam touches, the photosensitive drum's charge is severely reduced from –600VDC to a slight negative charge (around –100VDC). **4. Developing** Now that the surface of the drum holds an electrical representation of the image being printed, its discrete electrical charges need to be converted into something that can be transferred to a piece of paper. The EP process step that accomplishes this is the developing step. 5. **Transferring** At this point in the EP process, the developed image is rotating into position. The controller notifies the registration rollers that the paper should be fed through. The registration rollers move the paper underneath the photosensitive drum, and the process of transferring the image can begin; this is the transferring step. **6. Fusing** In the final step, the fusing step, the toner image is made permanent.			
VIII b)	There are mainly two types of touch screens, Resistive and Capacitive. A resistive screen mainly consists of two thin layers separated by a thin gap. These two layers both have a coating on one side, with the coated sides facing each other inside the gap. When the screen is pressed, the outer layer is pushed onto the next layer. The coating on the layers comes into contact and a voltage is passed, which is in turn processed as a touch in that	3 marks	3+3=6	6

	location. Resistive touch screens are versatile as they can be operated with a finger, a fingernail, a stylus or any other object. Capacitive Touchscreens work by sensing the conductive properties of an object, usually the skin on the fingertip. A capacitive screen is usually made of one insulating layer, such as glass, which is coated by a transparent conductive material on the inside. Since human body is conductive, which means electricity can pass through it, the capacitive screen can use this conductivity as input. When you touch a capacitive touchscreen with your finger, you cause a change in the screen's electrical field. This change is registered, and the location of the touch is determined by a processor.	3 marks		

IX a)	**Input Devices of laptops**
	• Keyboards
	• Mice and pointing devices
	  • Trackball
	  • Touchpad
	  • Point stick
	  • Touchscreen
	Keyboard
	- Laptop keys are smaller and packed together more tighty
	- Laptop keyboards are bulit into the lower portion of the clamshell
	Special Function Keys
	Since laptop keyboard is smaller, some keys like Home, Insert,PgUp and PgDn keys are consolidated into special multifunction keys. These keys are accessed using a special function (Fn) key. Inorder to use the specific key, hold the fn key down and then press the required key
	Video Function Keys
		1 mark
		1 mark
			9*1=9	9

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	1. LCD toggle key (typically F4) - used to connect to external monitor or projector - three states - laptop only, external output only and both displays 2. Dimming the screen(F7) 3. Brightening the screen (F8) **Audio adjustment keys** 1. Mute key (F10) 2. Decrease the volume (F11) 3. Increase the volume (F12) **Network Setting key** WiFi toggle key used to make the Wifi network on or off **<u>Mice and Pointing Devices</u>** The main pointing devices are **1. Trackball** - Trackball is a pointing device - It is essentially the same as a mouse turned upside down - The onscreen pointer moves in the same direction and at the same speed you move the trackball with your thumb or fingers. - Trackballs are cheap to produce. - they do not last as long as other types of pointing devices; a trackball picks up dirt and oil from operators' fingers. **2. Touchpad** - A Touchpad is a device that has a pad of touch-sensitive material. - The user draws with their finger on the Touchpad, and the onscreen	1 mark 1 mark 1 mark 1 mark		

	pointer follows the finger motions - There are two buttons for left or right clicking **3. Point Stick** - Found in IBM ThinkPad series of laptops - The point stick is a pointing device that uses a small rubber-tipped stick - When you push the point stick in a particular direction, the onscreen pointer goes in the same direction - The harder you push, the faster the onscreen pointer moves. - The stick does not return to center properly **4. Touchscreen** - Used to replace keyboard and mouse - Computer screens will have a film on them which is sensitive to touch - Also used smart phones and similar devices	1 mark 1 mark		
IX . b)	**1. Passcode Locks** A passcode is simply a password that is used to grant access. **2. Remote Wipes and Locators** There are certain applications that allow a user to control the device remotely to lock it, play a sound, display a message or wipe it clean. **3. Remote Backup** There are certain applications that are capable of backing your device's contents up over the internet, so that in case of any failure, your information can be easily stored on another device. 4. **Operating system updates** Operating system updates provides solutions for weaknesses and bugs in existing OS.	4 *1.5=6	4*1.5=6	6

X a)	**Features of Netbooks** **1. Size and Dimensions** They are smaller in size and light weight compared to laptops. Their screen sizes are normally 5 inches, 7 inches, 11 and 12 inches at a maximum. **2. Hardware Parts** Netbooks have less or reduced hardware parts. Optical drives, DVD readers, floppy disk drives, serial and parallel ports are normally absent in netbooks. 3-in-1 card slots, USB slots, Wi-Fi card, Ethernet port and webcam are present in a typical netbook. **3. Operating System** The dominant netbook operating systems are Windows XP and Linux. The Windows 7 starter edition is present among recent models. **4. Processor** Netbooks have low power, single core processors. The most popular processor, found in most netbook models, is the Intel Atom processor. **5. Storage and RAM** Most netbooks are equipped with a minimum of 1GB RAM, with upgrading to 2GB allowed. Netbooks can have either normal hard disk drives (HDD) or solid-state drives (SSD). **6. Battery Life** The battery depends on the processor and what's being done on the netbook. Average life should be 4 - 6 hours. **7. Computing Power** A netbook's functionality lies between a smartphone and a laptop. For word processing tasks, web browsing, spreadsheet works, minimum computer tasks can be performed on a netbook. Computer games, media functions, programming, such heavy-duty jobs can't be	8*1=8	8*1=8	8

	normally done. **8. Cost** Perhaps the best feature about a netbook, is the low cost. A netbook's prime advantage is its low cost.			
X b)	**<u>Expansion Buses and Ports</u>** - Laptops have expansion ports similar to those found in desktop computers as well as a couple that are found in laptops only. **PCMCIA (PC Card) Expansion Bus** - Personal Computer Memory Card International Association - Was initially used to expand memory - The interface is a thin 68-pin connector - PC Card bus now serves as a universal expansion bus that can accomodate nearly any device - PC Card architecture includes two other components 1. Socket Services Software is a BIOS-level interface to the PCMCIA bus slot. When loaded, it hides the details of the PC Card hardware from the computer. This software can detect when a card has been inserted and what type of card it is. 2. Card Services software is the interface between the application and Socket Services. PCMCIA 1.0 – 16-bit used for memory expansion only (5V) PCMCIA 2.x – 3.3V - Bus width of these cards is either 16-bit or 32-bit Three major types of PC Cards - Type I cards are 3.3mm thick and are most commonly used for memory cards. - Type II cards are 5mm thick and are mostly used for modems and	2 marks	2+1+1+ 1+1+1= 7	7

	LAN adapters but for sound cards, SCSI controllers, and other devices as well. - The Type III slot is 10.5mm thick. Its most common application is PC Card hard disks. **ExpressCard** - ExpressCard supports USB 2.0 and PCI Express - It is capable of transferring data at 2.5 Gbps - They are capable of accomodating faster technologies - Supports hot swapping - 26-pins only (compared to 68-pins) in PCI Card **Mini PCI and Mini PCIe** -Mini PCI is a smaller version of PCI designed for laptops - 32-bit, 33MHz and uses 3.3V power - Three types – Type I, Type II and Type III – differ in connector pins and size - Common Mini PCI devices are sound cards, modems, network cards, SCSI, ATA and SATA controllers. - Mini PCIe are smaller than ExpressCard - 52-pin connector - Suppots USB2.0 - Have 1.5V and 3.3V power options **USB Ports** - Most peripherals for laptops are found as either PC Cards or USB expansion devices - The USB port is the most common type for portable memory devices known as flash drives.	1 mark 1 mark 1 mark		

	Mouse/Keyboard Port - External keyboard or keypad is connected through USB ports - Some laptops come with a combination keyboard/mouse port - If no USB support exists, this port is used to connect a PS/2 mouse **Communications Ports** - Most laptops are equipped with wireless cards - may have connections for an analog dial-up modem or an infrared, cellular, Bluetooth, or Ethernet device	1 mark 1 mark		