Electronics Technicians Association, International
COMPETENCY REQUIREMENTS

Certified Computer Service Technician – CST 2008

This CATEGORIES listing serves to identify the major areas of training-study-knowledge and skills which the Computer Service Technician needs in order to perform the job of servicing the hardware and the systems software for personal computers. The 2008 CST COMPETENCIES address operating systems for Windows **current version, plus one older.**

The following is a listing of each topic considered necessary to be included in a course of study directed towards the education of workers who are expected to have knowledge and skills, including basic computer electronics, which make the technician competent to service and install hardware and software in the computer industry. There are 16 general categories of training. This COMPETENCY listing is the syllabus, or identification of each individual subject, in which the technician must be knowledgeable and skilled.

Once the CST has acquired these skills, abilities and knowledge, they will be able to enter employment in many parts of the computer industry. With minimal training in areas unique to specific products, the CST should become a profitable and efficient part of the computer industry workforce. CST's **may** pass the Associate CET exam and, by doing so, become a CET (showing the CST specialty area).

The following listings are comprised of the Major CATEGORIES and individual ITEMS, which have been verbalized into individual line item COMPETENCIES.

MAJOR CATEGORIES OF KNOWLEDGE – SKILLS REQUIRED:

1.0 Computer Assembly and Disassembly

2.0 Motherboards/Mainboards and Buses/System Resources

3.0 Processor Characteristics

4.0 Memory Characteristics

5.0 Secondary Storage Devices

6.0 Peripheral Devices

7.0 I/O Ports

8.0 Power Concepts and Power Supplies

9.0 Basic Networking Concepts

10.0 Portables

11.0 Digital Concepts

12.0 Troubleshooting/Preventive Maintenance

13.0 Operating Systems (Vista, Windows XP Pro & Home, 2000, Linux)

14.0 File Management

15.0 Safety Procedures/Handling

16.0 Workplace Practices

ETA® International
Computer Service Technician – CST
2008 Competency Requirements 1.0 - 16.3

1.0 Computer Assemble and Disassembly

- 1.1 Describe the proper removal and installation of a CPU
  - 1.1.1 Explain proper Electrostatic Discharge (ESD) procedures
  - 1.1.2 Describe removal procedures for CPU heatsink/fan
  - 1.1.3 Explain the importance of heatsink grease/thermal material
- 1.2 Describe the proper removal and the correct reinstallation of RAM including the use of proper banking procedures
- 1.3 List the tools required for removal and installation of all computer system components
- 1.4 Explain the precautions and routines involved in the removal and installation of the following:
  - 1.4.1 Power Supplies
  - 1.4.2 Expansion cards
  - 1.4.3 Motherboard jumpers and/or dipswitch configurations and settings on the motherboard
  - 1.4.4 Connections on a motherboard
  - 1.4.5 Secondary storage devices

2.0 Motherboards/Mainboard and Buses/System Resources

- 2.1 Identify CPUs used in specific sockets/slots
- 2.2 Explain PCI, PCI Express and Extended PCI expansion slot differences
- 2.3 Explain the differences between Mini-ITX and Micro-ATX mainboards
  - 2.3.1 Describe ATX, ITX, BTX, NLX and LPX mainboards and compare their differences
- 2.4 Describe the AGP port and its function
- 2.5 Compare different chipset versions and features
- 2.6 Explain the purpose of IRQs
  - 2.6.1 Define Programmable Interrupt Controller (PIC)
    - 2.6.1.1 List common set of registers
    - 2.6.1.2 Explain the difference between Programmable Interrupt Controller (PIC) and Advanced Programmable Interrupt Controller (APIC)
  - 2.6.2 Describe IRQ assignment/priority
- 2.7 List Common selections for COM1, Com2, LPT1, and LPT2
- 2.8 Explain the purpose and use of DMAs
- 2.9 Describe the memory address scheme and its function
- 2.10 Describe the architecture and use of I/O addresses
- 2.11 Explain Device Drivers and how they work within the computer system
- 2.12 Identify memory module sockets
- 2.13 Explain how memory is addressed
- 2.14 Define the function of the Control, Data, and Address Buses
- 2.15 Explain the configuration of CMOS
- 2.16 Explain how to clear BIOS passwords
- 2.17 Describe Flash BIOS
- 2.18 Describe the procedures to upgrade/update BIOS
- 2.19 Explain how BIOS Beep codes are used

3.0 Processor Characteristics

- 3.1 State the Word Size (Internal Data Bus) and External Data Path bit widths for various CPUs
- 3.2 Explain the differences between the L1 and L2 cache
- 3.3 Describe Advanced Transfer Cache and its benefits
- 3.4 Describe Dual Independent Bus technology (frontside/backside bus)
  - 3.4.1 Explain the use of a front side bus
  - 3.4.2 Explain the use of a back side bus
- 3.5 Describe the reasons for CPU underclocking and overclocking
- 3.6 List the advantages and disadvantages of overclocking
  - 3.6.1 Describe 'burn-in'

3.7 List the risks associated with overclocking
3.8 Explain why it is important to have CPU cooling
3.9 Describe techniques used in CPU cooling

4.0 Memory Characteristics

4.1 Identify the differences in SIMM, DIMM, RIMM – SODIMM Ram packages
4.2 Compare RAM package bit widths
4.3 Describe SRAM, SDRAM, DRAM, DDR, and RAMBUS characteristics and installation procedures
4.4 Describe the proper 'Banking' procedures when installing various RAM modules with various processors
4.5 Explain Non-parity, Parity and ECC memory
4.6 Explain memory requirements for different operating systems, including minimum and maximum memory requirements

5.0 Secondary Storage Devices

5.1 Compare Serial ATA and Parallel ATA drive specifications
5.2 Explain how data is stored on a hard drive
5.3 Compare PIO modes, ATA specs, UDMA (Various Speeds)
5.4 Describe EIDE cable differences for PIO mode/ATA33 and ATA66/ATA100 and ATA133
5.5 Describe SCSI hard drive technology and how it differs from the EIDE interface
5.6 Compare Serial ATA drives (specifications) to (P)IDE drives technologies
5.7 Describe the CD-ROM/CD-RW technology and state its advantages and uses
5.8 Compare DVD, DVD-RAM, DVD-RW, and DVD+RW technologies
5.9 Explain the applications for USB drive
5.10 Explain how to perform manufacturer-specific installation procedures
5.11 Explain Blu-ray technology

6.0 Peripheral Devices

6.1 Explain Modem technology and standards
6.2 Explain how to install and configure a modem
6.3 Explain how to install and use soundcards
6.4 Describe the basic features of video monitors and safety aspects
6.5 Compare the different printer technologies used in PCs
6.6 Describe scanner technology, installation, and operation
6.7 Describe digital camera operation and interfacing with PCs
6.8 Explain TWAIN image acquisition compliance for scanners and digital cameras
6.9 Compare the MPEG standards for Digital Video
6.10 Explain keyboard theory
6.11 Explain mouse theory
6.12 Compare PS2 and USB peripheral technologies
6.13 Describe the differences between an LCD, CRT and Plasma monitor
  6.13.1 Explain the differences between SVGA, DVI, and HDMI
  6.13.2 Explain Scalable Link Interface (SLI) when used with dual video boards
6.14 Describe how to install a NIC (Network Interface Card) and a wireless NIC

7.0 I/O Ports

7.1 Define the RS232c standard for serial ports and its purposes
7.2 Describe the SPP, EPP and ECP Parallel ports
7.3 Compare the USB ver1.1 and ver2.0 transfer rates and intended uses
7.4 Explain IEEE 1394 Firewire (I.Link) operation; state transfer rates and intended uses
7.5 Describe PS/2 ports and their purpose
7.6 Explain how infrared communications takes place in PCs
7.7 Describe Game/Midi ports
7.8 Explain how to identify various ports by their connectors on a PC

7.9 Describe the following IEEE 802.11 protocols:
- 7.9.1 802.11a
- 7.9.2 802.11b
- 7.9.3 802.11g
- 7.9.4 802.11n

7.10 Compare differences between Wireless USB, Bluetooth, IEEE 802.11x RF properties and uses

7.11 Describe the architecture and function of IEEE 802.16e (WIMAX) protocol

8.0 Power Concepts and Power Supplies

8.1 Compare the usage and capabilities of AT, ATX, ATX12V power supplies

8.2 Identify AT, ATX, and ATX12V power supplies

8.3 List the major differences between AT, ATX and ATX12V

8.4 Explain the purposes of a UPS (uninterruptible power supplies)

8.5 Compare ATX vs. BTX power supply family

9.0 Basic Networking Concepts

9.1 Describe the proper installation and configuration of a NIC (Network Interface Card)

9.2 Explain why TCP/IP Protocol is widely used and the configuration process

9.3 Explain the OSI model and its applicable layers

9.4 Explain and draw a diagram of the following Network Topologies:
- 9.4.1 Point-to-Point
- 9.4.2 Star
- 9.4.3 Ring
- 9.4.4 Bus
- 9.4.5 Mesh
- 9.4.6 Tree

9.5 **Networking Technologies:**
- 9.5.1 Describe Ethernet Technology and its method of data transmission
- 9.5.2 Differentiate between CMSA/CD vs.CMSA/CA (CA covered by 802.11x standards) Wired = CD
- 9.5.3 Describe Token Ring Technology and its method of data transmission
- 9.5.4 Describe the differences between Bluetooth and IEEE 802.11x RF properties
- 9.5.5 Compare the differences between Broadband, Digital Line Subscriber (DSL) and dialup technologies.

9.6 **Cabling:**
- 9.6.1 Define 10/100/1000BaseT (Twisted pair) and its use
- 9.6.2 Describe 10/100 Gigabit Ethernet.
- 9.6.3 Describe the design difference between a crossover cable and a straight through cable
- 9.6.4 Compare the differences and advantages between fiber optic cable and Twisted Pair
- 9.6.5 List the harmful effects of EMI (electromagnetic interference)
- 9.6.6 Describe methods of troubleshooting cabling systems

9.7 Describe the principles of data integrity and protection

9.8 Explain the basics of Network Operating Systems (NOS)

9.9 Explain how Directory/File/Drive Sharing is accomplished

9.10 List the throughput, range, and frequencies associated with 802.11 a, b, g and n

9.11 **Network Security:**
- 9.11.1 Describe the principles of network security for wired and wireless networks
- 9.11.2 Explain the need for a network firewall
- 9.11.3 Explain the different types of encryption used in Wi-Fi equipment

10.0 Portables

10.1 Explain the technology and advantages of LCD displays

10.2 Describe precautions and usage of batteries in laptop PCs

10.3 Explain common power management techniques

10.4 Describe PCMCIA card types and their uses

11.0 Digital Concepts

- 11.1 Compare baseband and broadband technologies.
- 11.2 Explain how DAC's and ADC's convert Digital to Analog and Analog to Digital
- 11.3 Describe interfacing connectors and how both analog and digital data are processed
- 11.4 Describe and convert Binary, Octal, and Hexadecimal numbering systems

12.0 Troubleshooting/Preventive Maintenance/Security Measures

- 12.1 Explain how to distinguish hardware from software issues
- 12.2 Explain the functions of PC test equipment
- 12.3 List utility software that technicians should be familiar with (Scandisk, Defragmentation, OEM specific utilities, etc.)
- 12.4 List preventive maintenance procedures relating to static safety causes and effects
- 12.5 Describe the differences between NTFS and FAT
- 12.6 Describe the function of Antivirus software
- 12.7 Describe the deployment and application of both software and physical firewalls
- 12.8 Describe the usage of Adware and Spyware
- 12.7 Explain how to properly document and record a computer repair
- 12.8 Explain the use of POST diagnostic cards for troubleshooting
- 12.9 List environmental problems common to PCs (temperature, dust and dirt, smoke, etc.)
- 12.10 Explain how performance Utilities/Diagnostics (such as Norton or McAfee) are used
- 12.11 Describe the usage of PCAnywhere and Laplink
- 12.12 Explain the differences between manufacturers' BIOS Beep Codes
- 12.13 Explain the use of basic troubleshooting commands and utilities (such as Fdisk, Format, Sys, Xcopy, etc.) as used in the current + one older version(s) of Windows OS
  - 12.13.1 Describe inter-relations between commands on different file systems (i.e., IPCONFIG, IFCONFIG, WINIPCFG vs. DIR – Basic navigation)
- 12.14 Describe the Microsoft Management Console (MMC) snap-in utility and its application for managing system administrative tools

13.0 Operating Systems (Vista, Windows XP Pro & Home, 2000, Linux)

- 13.1 Demonstrate the use of basic troubleshooting commands (such as Fdisk, Format, Sys, Xcopy, etc.)
- 13.2 Explain the use of Command Switches
- 13.3 Describe general differences between Windows XP, Vista and Linux
- 13.4 Perform common functions of Windows Desktop
- 13.5 Describe the use of Windows Explorer for file and folder management
- 13.6 Explain how to use Windows Device Manager for installing and troubleshooting hardware
- 13.7 Explain Windows Registry Management as it pertains to editing, backup, and restoration
- 13.8 Define purposes and usage of Virtual Memory
- 13.9 Explain how to calculate and adjust Virtual Memory settings
- 13.10 Explain the common steps in configuring Windows
- 13.11 Explain the purposes and usage of Msconfig.exe (Vista, Win XP Pro & Home)
- 13.12 Describe the purpose of and how System Restore is used (Win XP)
- 13.13 Describe Software Uninstall Procedures for Windows Applications
- 13.14 Explain how to use Linux Disk Management basics
- 13.15 Explain how to use Linux File Management commands

14.0 File Management

- 14.1 Explain the differences and advantages of FAT16, FAT32, NTFS, HPFS
- 14.2 Explain how GRUB, MBR and DOS boot records are used
- 14.3 Describe the procedure used to partition a given hard drive
- 14.4 Explain the types of partitions and their usage
- 14.5 Explain the procedures for directory (folder) creation and deletion
- 14.6 Describe procedures for file usage (saving, deleting, copying, moving, recovery)
- 14.7 Describe the defragmentation process, how it is accomplished, and how often to use it
- 14.8 Describe how the Data Backup process works
- 14.9 Compare the various types of backups

15.0 Safety Procedures/Handling

15.1 Explain the proper use of ESD equipment (bench pads, straps, etc.)
15.2 Explain precautions when handling components
15.3 Explain why components must be stored in anti-static packaging

16.0 Workplace Practices

16.1 Explain how to use parts procurement resources, references and databases
16.2 Describe good and bad work bench housekeeping – area safety & efficiency, and first aid
16.3 Describe potential hazards in both shop and in-home environments

Suggested Study Material:

A+ Guide to Managing and Maintaining Your PC; 6th Ed.; Jean Andrews; Course Technology; ISBN 0-619-21758-8; Nov 2006; hardcover; 1347 pgs.

Upgrading and Repairing PCs; 18th Ed.; Scott Mueller; Published by QUE; ISBN 0-7897-3697-7; Oct 2007; hardcover; 1584 pgs.

Maintaining and Repairing PCs; 5th Ed.; Chuck Brooks; Prentice Hall; ISBN 0-13-240981-X; Oct 2006; hardcover; 1008 pgs.

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