



कौशल बलम्

Draft Syllabus for the Trade of

***COMPUTER HARDWARE & NETWORK
MAINTENANCE***

Under

Craftsmen Training Scheme

**Designed in
2014**

**Government of India
Ministry of Labour & Employment
D.G.E. & T**

GENERAL INFORMATION FOR
COMPUTER HARDWARE & NETWORK MAINTENANCE

Name of the Sector	IT & ITES
Name of CTS Course	COMPUTER HARDWARE & NETWORK MAINTENANCE (as suggested by the experts)
CTS Code	To be generated
Competency as per N.C.O. Code	To be generated (Trimmed, Merged and reviewed version of "Mechanic Computer Hardware" and "Network Technician" Courses)
Duration of Course	One Year divided in two Semesters of Six Months each.
Entry Qualification of Trainee	Passed 10th with Science and Maths as subjects.
Unit size (No. of Trainees)	20
Power Norms	3.45 KW
Space Norms (Workshop and Class Room)	Lab. - 70 Sq. m., Class Room – 30 Sq. m.
Qualification for the Instructor	<p><u>Technical –</u></p> <p>(i) Graduate in Engineering / Technology in Computer Science / IT/Electronics & Communication from Recognized university OR</p> <p>(ii) Post Graduate in Computer Science / Computer Application / IT / Electronics OR</p> <p>(iii) Bachelor in Computer Science / Computer Application / IT OR NIELIT "A" Level OR</p> <p>(iv) Three year Diploma from recognized Board / Institution in Computer Science / IT/ Electronics & Communication OR</p> <p>(v) National Apprenticeship Certificate or National Trade certificate in Computer Hardware & Network trade and National Craft Instructor Training Certificate if available.</p> <p><u>Experience in relevant field after eligible qualification–</u></p> <p>For (i) & (ii) - One year</p> <p>For (iii) & (iv) - Two years</p> <p>For (v) - Three years after NAC/NTC</p>

Job Role:

The role of a **Computer Hardware & Network Maintenance** personnel is to support and maintain computer systems, desktops, and peripherals. This includes installing, diagnosing, repairing, maintaining, and upgrading all hardware and equipment while ensuring optimal workstation performance. The person will also troubleshoot problem areas in a timely and accurate fashion, and provide end user training and assistance where required. Install, maintain and setup LAN with Internet Connection.

In a Nutshell :

- Installing, maintaining and repairing software or hardware
- Troubleshooting different computer issues
- Determining and installing appropriate security measures
- Installing & Configuring basic computer networks
- Providing technical support on-site or via phone or email
- Install, configure, and maintain common end user application software. May train and provide assistance to end users.
- Troubleshoots software and hardware problems related to Internet applications.

Syllabus for the Trade of
“COMPUTER HARDWARE & NETWORK MAINTENANCE”
Under CTS

Semester – I

Duration : 6 months

Week No.	Practical	Theory	Engineering Drawing	Workshop SC. & Cal.
1	<p><u>Familiarization with the Institute and Safety</u></p> <p>a) Visits to workshops, labs, office, stores etc., of the institute.</p> <p>b) Demonstration of safety precaution.</p> <p>c) Demo of first aid practice.</p> <p>d) Demo of artificial respiration and practice.</p> <p>e) Demo of electrical safety precautions.</p>	<p>a) Punctuality and Discipline expected of trainees. Course duration, methodology and structure of the training program.</p> <p>b) About the institute and infrastructure.</p> <p>c) Safety in moving and shifting heavy and delicate equipments.</p> <p>d) First aid.</p> <p>e) Artificial respiration.</p> <p>g) Electrical safety.</p>	<p>What is Engineering drawing, Importance</p>	<p>Quadratic equation, Simultaneous linear equation in two variables.</p>
2	<p><u>Basic concepts of Electricity –</u></p> <p>a) Identify specification of types of fuses. Identification and specification of type of switches.</p> <p>b) Identification of meter types and measuring range.</p> <p>c) Construct a simple circuit using AC/DC supply, lamp, fuse and switch..</p> <p>d) Measure circuit voltage and current using voltmeters</p>	<p>a) Concept of current and voltage. AC, DC Supply indicating lamps. Different types of Fuses and their applications. Different types of connectors used in electrical and electronic applications. Different types of switches used in electrical and electronic applications.</p> <p>b) Circuit voltage and current. Measuring circuit voltage and current using voltmeters and ammeters. AC and DC meters.</p> <p>c) Measuring instruments, MC, MI type, Ammeter, Voltmeter, Multimeter for measuring voltage and</p>	<p>Free hand sketching of straight lines, rectangles, square, circles, polygons, etc.</p>	<p>Electricity: Negative & positive polarities, structure of Atoms, Electrons & protons, coulomb, unit of charge, volt, unit of potential difference, and charge in motion is current.</p>

	<p>and ammeters.</p> <p>e) Measure voltage and current using Multi-meter (analog-digital).</p> <p>f) Use Multimeter to check fuses, lamps and switches.</p> <p>g) Measure DC and AC power using V-I method and using power meter.</p>	<p>current. Construction, characteristics/ features and specification. Digital Multimeter</p> <p>d) Meaning of Circuit and basic electrical circuits.</p> <p>e) Meaning of resistance, continuity and continuity testers. Multimeter for checking continuity.</p> <p>f) Concept of Power and measurement using V&I meter and Power meter.</p>		
3	<p><u>Resistors.</u></p> <p><u>Soldering and De-soldering.</u></p> <p>a) Identify different types of resistors from physical appearance.</p> <p>b) Identify resistor value and tolerance using colour code.</p> <p>b) Measuring resistance using Multimeter.</p> <p>c) Soldering and desoldering techniques, practice using hook-up wires. Soldering resistors on Tag board.</p> <p>d) Verification of Ohms Law and Kirchhoff's Laws.</p> <p>e) Soldering resistors on PCB.</p> <p>f) De-soldering practice.</p> <p>g) Experiment using P.T.C and NTC resistors.</p> <p>h) Experiment to check VDR's.</p>	<p>a) Classification, characteristics and application of different types of resistors.-carbon film, metal film, wire wound, cermet and surface mounted.</p> <p>b) Colour coding of resistors. Calculating measuring resistance value and its tolerance value. Wattage of resistors, specific resistance and their importance.</p> <p>c) Resistors in series and parallel.</p> <p>d) Soft soldering and precautions to be taken for making a good solder joint. Types of solder and need of soldering paste.</p> <p>e) Ohms law and Kirchooff's Laws.</p> <p>f) Printed circuit boards and its application.</p> <p>g) De-soldering tools.</p> <p>h) Temperature dependent resistors and their applications.(PTC and NTC)</p> <p>i) Voltage dependent resistors</p>	Free hand sketching of tools, reading of simple drawings and concepts of dimensions.	Fundamentals and derived units, Supplementary units, of electrical parameters.

	<p>i) Experiment to check LDR's.</p> <p>j) Test Pots, Presets.</p>	<p>(VDR).</p> <p>j) Photoelectric effect, Light Dependent resistors.</p> <p>k) Variable resistors, pots, presets, types and application. Log and Linear resistors.</p>		
4	<p><u>INDUCTANCE</u></p> <p>a) Identification of different types of inductors and its specifications.</p> <p>b) Measure inductance using LCR meter. Calculate inductive reactance at different input signal frequencies.</p> <p>c) Demo on self and mutual induction.</p> <p>d) Check step down transformers.</p> <p>e) Rewind a transformer to given specification using winding machine.</p> <p>f) Finding losses and efficiency of given transformers.</p> <p>g) Identifying and testing high frequency transformers used in electronic circuits.</p>	<p>a) Definition of inductance. Properties. Types of inductors and their application.</p> <p>b) Inductive reactance, measuring inductance and inductive reactance. Meaning of lead, lag. Effect of inductor on power factor. Frequency dependence of inductive reactance.</p> <p>c) Self and Mutual inductance. Coefficient of coupling.</p> <p>d) Transformers. Turns ratio. Transformer winding. Winding machines.</p> <p>e) Transformer losses and efficiency.</p> <p>f) Uses, losses, efficiency type of cores and uses for LF, HF, VHF transformer.</p> <p>g) Transformers used in high frequency applications.</p>	<p>Dotted lines, chain lines etc.</p> <p>Magnifying glass.</p>	<p>Ohms law: Current, voltage, resistance, and related problems, multiple and submultiple units, electric power, power dissipation in resistance, power formulas.</p>
5	<p><u>Capacitance and Resonance circuits.</u></p> <p>a) Identify of different types of capacitors from colour code and typographic code.</p> <p>b) Test working condition of capacitor. Measure capacitance using RLC meter.</p> <p>c) Measure</p>	<p>a) Working principle of capacitors. Electrostatic action, dielectric constant. Unit of capacitance and capacitive reactance. Types of Capacitors-electrolytic, ceramic, polyester, tantalum, mica, surface mounted. Colour coding, and tolerance.</p> <p>b) Measuring capacitance and capacitive reactance.</p> <p>c) Behavior of capacitance at different frequencies.</p> <p>d) Capacitors in series and parallel.</p>	<p>Reading of simple drawing, free hand sketching of simple solids with dimensions.</p> <p>Freehand sketch of solids viewed perpendicularly to their surface and axes.</p>	<p>Series circuits: Total resistance, same current in series circuits, IR voltage drops, Sum of IR drops equal to the applied voltage.</p>

	<p>capacitive reactance at different frequencies.</p> <p>d) Measure capacitance and capacitive reactance of, capacitors in series and capacitors in parallel.</p> <p>e) Find the resonance frequency of a given Series and parallel resonance circuit.</p>	<p>e) Meaning of Resonance. Application of resonance. Series and parallel resonance circuits</p>		
6	<p><u>Electronic Components</u> –</p> <p>a) Identify terminals of different types of diodes. Record its specifications referring to diode data sheet.</p> <p>b) Plot forward and reverse characteristics of diode Testing working condition of diodes.</p> <p>c) Construct and test a half wave and full wave diode rectifiers.</p> <p>d) Construct and test a Bridge rectifier with and without filter</p> <p>e) Construct a bridge rectifier with capacitance input filter.</p> <p>f) Draw Zener diode characteristics, Simple voltage regulator using zener diode.</p>	<p>a) Semiconductor, intrinsic and extrinsic semi conductors, P and N type semiconductor. Development of P.N. junction barrier potential. Effect of temperature. Breakdown voltage.</p> <p>b) Different types of Diodes. Diode terminals. Diode specifications using data book.</p> <p>c) Forward and reverse characteristics of diode. Testing diodes using Multimeter.</p> <p>d) Half wave and Full wave rectifiers using diodes. Transformer requirements. Calculating output DC, ripple factor.</p> <p>e) Bridge rectifier. Calculating output DC, ripple factor.</p> <p>f) Filters for rectifiers. Calculating output DC, ripple factor.</p> <p>g) Zener diode-Its characteristics and application for voltage regulation. Calculating the series resistor for required current rating.</p> <p>h) Specifications of a regulated power supply and testing a power supply for its specifications.</p>	<p>Electronic Component symbols, Series circuit, Representation of IR voltage drops.</p> <p>-</p>	<p>Polarity of IR voltage drops, Total power in series circuits, related exercise.</p> <p>-</p>
7	<p><u>Transistor and Amplifiers</u></p> <p>a) Identify types</p>	<p>a) Working principle of PNP, Bipolar transistors.</p>	<p>Free hand sketch of circuits and wiring</p>	<p>Transistor amplifiers, Voltage</p>

	<p>transistors based on their physical appearance. Identify the leads of the given assorted types of transistors.</p> <p>b) Quick test given transistors using Multimeter. Identify opens, shorted junctions .</p> <p>c) Wire and find the gain of amplifiers in - CB, CE, CC configurations.</p>	<p>Types of transistors and applications. Leads of transistors and their identification.</p> <p>b) Forward and reverse bias of transistor Junction. General values of junction resistances. Quick testing a transistor-using Multimeter.</p> <p>c) Transistor configuration - CB, CE, CC, alpha, beta. Types of Biasing of transistor amplifiers, comparison and applications. Thermal runaway. Steady and Dynamic characteristics. Testing- get frequency response, gain bandwidth product, signal to noise ratio.</p>	<p>diagrams.</p>	<p>Gain</p>
8	<p><u>Power supply</u></p> <p>a) Practice on identifying and using the controls on a regulated power supply.</p> <p>b) Assemble and test a series regulated power supply.</p> <p>c) Assemble and test a shunt regulated power supply.</p> <p>d) Assemble and test a fixed voltage regulator using 3pin IC.</p> <p>e) Assemble and test a variable voltage regulator using IC.</p> <p>f) Assemble a simple inverter and converter for use with emergency lamp.</p> <p>g) Identify the parts and controls of a</p>	<p>a) Unregulated, regulated DC Power supply specifications. Application of different types of power supply for specific application types.</p> <p>b) Series regulator using transistor. Short circuit protection. Overload protection.</p> <p>c) Shunt regulators using transistors.</p> <p>d) Fixed Voltage regulators using IC's.</p> <p>e) Variable voltage regulators using IC's.</p> <p>f) Mains voltage stabilizers.</p> <p>g) Inverters and converters.</p> <p>h) Un-interrupted power supply, types and applications.</p>	<p>Parallel circuits, Branch currents, representation.</p>	<p>Parallel circuits: Applied voltage is the same across parallel branches, Each branch current, Total current equal to the sum of the branch currents.</p>

	UPS. Practice switch-on and switch-off procedures.			
9	<p><u>DIGITAL ELECTRONICS</u></p> <p>a) Identify the specifications of given digital IC's referring to data books.</p> <p>b) Verify the truth table of two input OR, NOR, AND, NAND, NOT gates.</p> <p>c) Verify of truth table of multiple input logic gates.</p> <p>d) Verify the truth table of XOR and XNOR Gates.</p> <p>e) Realization of different gate type using NAND gates.</p> <p>f) verification of Boolean laws.</p> <p>g) Realization of half adder & full adder using NAND gates. Realization half subtractor and full subtractor using NAND gates.</p> <p>h) Verification of truth table of 7483-4bit adder.</p> <p>i) Verifying encoder/ decoder/ multiplexer/ demultiplexer IC truth tables.</p> <p>j) Realization and verification of truth table of RS, JK and MS- JK flip-flop.</p> <p>k) Realization and verification of D- flip flop.</p> <p>l) Realization and verification of up &</p>	<p>a) Number systems and conversions. Classification of digital IC's. Use of data book for identification of digital IC's.</p> <p>b) Basic LOGIC GATES and truth table. Boolean algebra.</p> <p>c) Logic families, logic levels, propagation delay. Multiple input gates.</p> <p>d) XOR, XNOR gates and application.</p> <p>e) Simplification of Boolean equations.</p> <p>f) Combinational logic circuits. g) Half adder, full adder, parallel binary adder, half subtractor, full subtractor.</p> <p>h) Commercially available adders/subtractors.</p> <p>i) Comparator, decoders, encoders, multiplexer, demultiplexer.</p> <p>j) Parity generators/checkers. RS Flip - Flop, JK flip-flop, Master- Slave flip-flops.</p> <p>k) Types of triggering and applications. D flip-flops.</p> <p>l) Counters, ripple, synchronous, up-down, scale-n counters.</p> <p>m) Principles of A/D & D/A converter. Commercially available A/D & D/A converters. Applications.</p> <p>n) Shift registers. Types,</p>	Logic gates, Combinational gates, other circuits.	- Do -

	<p>down (sync/async) counter.</p> <p>m) Verification of A/D & D/A converter.</p> <p>n) Realization of shift registers using FF.</p> <p>o) Verification of Right-shift, Left-shift registers.</p> <p>p) Verification of Serial-in-parallel out and parallel in serial out of data.</p> <p>q) Representation of logic function's truth table using K-Map.</p>	<p>applications.</p> <p>o) Commercially available shift registers and applications.</p> <p>p) Conversion of serial data into parallel and vice-versa.</p> <p>q) Concept of Karnaugh Map (K-Map).</p>		
10	<p><u>Other Mechanical, Electrical & Electronics Accessories.</u></p> <p>Working with Gears, Belts, Stepper Motor, Drive.</p> <p>Identification and Testing of Sensors.</p> <p>Working with Relays.</p> <p>Identification of different advanced Intel microprocessor chips.</p> <p>Identification of different advanced microprocessor chips other than from Intel.</p>	<p>Basics of gears, Belts, Stepper Motor, Drive.</p> <p>Sensors, its types and working principles.</p> <p>Relays, types and its working principles.</p> <p>Introduction to Microprocessor, Pentium processor architecture basics.</p> <p>Timing Circuits, Electronic Display (7 segment, LED, LCD, Plasma, LED matrix).</p>	<p>Types of resistors, colour coding, tolerance representation, Capacitor structure, symbol, types, colour code, Variable capacitors</p>	<p>Temperature, pressure. Newton's law of motion, applications, momentum. Simple problems</p>
11	<p><u>DeskTop : PC Repair Safety:</u></p> <ul style="list-style-type: none"> • <i>Important Safety Basics</i> • <i>Identification, specification and application of basic hand tools.</i> • <i>How to handle components to ensure their longevity</i> 	<p>a) <i>Introduction to computers, classification, generations, applications. Basic blocks of a digital computer.</i></p> <p>b) <i>Hand Tools Basics and Specifications.</i></p> <p>a) Types of cabinets, relation with mother board form factor. Precautions to be taken while opening and closing PC cabinet.</p> <p>b) Main devices,</p>	<p>Block dig of personal computer, drawings of keyboard, monitor, mouse, FDD, HDD, floppy disc. CD ROM.</p>	<p>Logarithm definition, properties, simple problems.</p>

	<ul style="list-style-type: none"> • <i>What one shouldn't wear while working inside a computer</i> • <i>The danger of static electricity</i> • <i>How to protect a PC from lightning strikes and power outages</i> 	<p>components, cards, boards inside a PC(to card or device level only).</p> <p>c) Types and specifications of the cables and connectors used for interconnecting the devices, boards, cards, components inside a PC.</p> <p>d) Precautions to be taken while removing and/or re-connecting cables inside a PC.</p>		
12-13	<p><u>Hardware Identification</u></p> <ul style="list-style-type: none"> • <i>Identify the front and rear panel controls and ports on a PC</i> • <i>Cases</i> • <i>Cooling</i> • <i>Cables & Connectors</i> • <i>Power Supplies</i> • <i>Power Supply Connections</i> • <i>Motherboard Connections</i> • <i>Motherboard Components</i> • <i>CPU (Processor)</i> • <i>RAM (Memory)</i> • <i>Hard Drive Connections</i> • <i>Mechanical vs. Solid State Drives</i> • <i>ROM Drives</i> • <i>Video Cards</i> • <i>Sound Cards</i> <p>Use Of Debug Card Post Error & Code, SMPS Tester, PCI slot testing tool.</p>	<p>(a) <i>Types of I/O devices and ports on a standard PC for connecting I/O devices.</i></p> <p>b) <i>Function of keyboard, brief principle, types, interfaces, connectors, cable.</i></p> <p>c) <i>Function of Mouse, brief principle, types, interfaces, connectors, cable.</i></p> <p>d) <i>Function of monitor, brief principle, resolution, size, types, interfaces, connectors, cable.</i></p> <p>e) <i>Function of Speakers and Mic, brief principle, types, interfaces, connectors, cable.</i></p> <p>f) <i>Function of serial port, parallel port, brief principle of communication through these ports, types of devices that can be connected, interface standards, connectors, cable.</i></p> <p>g) <i>Precaution to be taken while connecting/removing connectors from PC ports. Method of ensuring firm connection.</i></p>	Front and Rear view of a PC	Alternating voltage and current: AC fundamentals, RMS, Average values.
14-15	<p><u>Hardware Remove-Test-Replace/ Install</u></p>	<p><i>Types of Processors and their specifications (Intel: Celeron, P4 family, Xeon,</i></p>	Explanation of simple orthographic	Arithmetic and geometric

	<ul style="list-style-type: none"> • Removing RAM • Installing RAM • Removing a ROM Drive • Installing a ROM Drive • Removing a Hard Drive • Installing a Hard Drive • Defects related to SMPS, its cable, connector and servicing procedure. • Removing a Power Supply • Installing a Power Supply • Removing a Video Card • Installing a Video Card • Install Expansion Cards • Removing Fans • Installing Fans • Removing the Motherboard • Installing the Motherboard • Removing the Processor • Installing the Processor • Installing a CPU Cooler • Troubleshooting • Checking the Power Switch • Removing the CMOS Battery • Seating Expansion Cards 	<p><i>dual core, quad core, core 2 duo, i3,i5,i7 and AMD).</i></p> <p>a) Memory devices, types, principle of storing. Data organization 4 bit, 8 bit, word.</p> <p>b) Semiconductor memories, RAM, ROM, PROM, EMPROM, EEPROM, Static and dynamic.</p> <p>c) Example of memory chips, pin diagram, pin function of</p> <p>b) Concept of track, sector, cylinder. FD Drive components- read write head, head actuator, spindle motor, sensors, PCB.</p> <p>c) Precaution and care to be taken while dismantling Drives.</p> <p>d) Drive bay, sizes, types of drives that can be fitted. Precautions to be taken while removing drive bay from PC.</p> <p>f) HDD, advantages, Principle of working of Hard disk drive, cylinder and clusture, types, capacity, popular brands, standards, interface, jumper setting. Drive components- hard disk platens, and recording media, ,air filter, read write head, head actuator, spindle motor, circuit board, sensor, features like head parking, head positioning, reliability, performances, shock mounting capacity. HDD interface IDE, SCSI-I/2/3 comparative study. Latest trends in interface technology in PC and server HDD interface.</p> <p>g) Precautions to be taken while fitting drives into bays and bay inside PC cabinet.</p> <p>h) CMOS setting.(restrict to drive settings only).</p>	<p>projection 3rd angle.</p>	<p>progression , sum of n terms, simple calculations</p>
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16-17	<p><u>Windows Installation</u></p> <p>A walkthrough of installing Windows 7 / 8</p> <p>A walkthrough of installing Windows XP</p> <p>Imaging: create a Windows system image</p> <p>How to Backup/Restore your Windows partition with the bootable image disk</p> <p>Duplicating a partition (creating a multiboot system)</p> <p>A multiboot system: the Windows bootmanager vs. an alternative bootmanager</p> <p>Setting up a multiboot/dualboot system</p> <p>Dual Boot Ubuntu and Windows</p> <p>Windows XP registry tweaks</p>	<p>Types of software. System software-OS, Compiler. Application software-like MS office. High level, low level language, Computer application scientific industrial and business. Functions of an operating system. Disk operating system.</p> <p>a) . Concept of GUI, Modes of starting on different occasions.</p> <p>b) Desktop, Icon, selecting, choosing, drag and drop.</p> <p>c) My computer, network neighbourhood/ network places.</p> <p>d) Recycle bin, briefcase, task bar, start menu, tool bar, and menus.</p> <p>e)Windows Explorer.</p> <p>f) Properties of files and folders.</p> <p>g) Executing application programs.</p> <p>h) Properties of connected devices.</p> <p>i) Applications under windows accessories.</p> <p>j) Windows Help.</p> <p>k) Finding files, folders, computers.</p> <p>l) Control panel. Installed devices and properties.</p>	Block Diagram, Front and Rear view of a monitor,.	Problems of binary addition, decimal to binary, binary to decimal, decimal to hexadecimal, hexadecimal to decimal.
18	<p><u>Data Backup</u></p> <ul style="list-style-type: none"> • 3 types of media to use when backing up your data, and when each method is appropriate • How to create 	<p>Utilities for recovering data from defective/bad hard disks.</p> <p>a) Introduction to removable storage devices, Bulk data storage devices-magnetic, optical, magneto optical drives, WORM drives.</p> <p>b) CD ROM drives-Technology, Types of CD</p>	Connections of a Computer	Binary addition and subtraction.

	<p>automated backups to ensure you always have a recent backup</p> <ul style="list-style-type: none"> • Learn how to manually backup data • How to make an exact copy (clone) of a hard drive <p><u>Hardware Troubleshooting</u></p> <ul style="list-style-type: none"> • The danger in not diagnosing problems first • Learn how to test your RAM • Check your hard drive for errors <p><u>PC Cleaning</u></p> <ul style="list-style-type: none"> • The best cleaning supplies to use • How to increase airflow and increase your computer's lifespan • How to clean your computer 	<p>drives, working principle application.</p> <p>c) Minor repairs and maintenance of CD ROM drives.</p> <p>d) Technology, working principle, capacity, media of ZIP drives.</p> <p>e) Important parts and functions of a ZIP drive.</p> <p>f) Minor repairs and maintenance of ZIP drive.</p> <p>g) Technology, working principle, capacity, media of DAT Drive and back-up procedures.</p> <p>h) Important parts and functions of DAT drive.</p> <p>i) Minor repairs and maintenance of DAT drive.</p> <p>j) Technology, working principle, capacity, media of DVD ROM drive .</p> <p>k) Important parts and functions of DVD ROM drive.</p> <p>l) Minor repair works on a DVD ROM drive.</p> <p>m) Technology, working principle, capacity, media of CD WRITER and use different modes of writing on a CD. Using of utility for CD writing.</p> <p>n) Minor repair works on a CD WRITER.</p> <p>o) Technology, working principle, capacity, media of Magneto- Optical Disk (MOD) drives. Applications.</p> <p>p) Important parts and functions of MOD drive.</p> <p>q) Minor repair works on MOD.</p> <p>r) Latest trends in backup devices/media.</p>		
19	<p><u>Hard Drives</u></p> <ul style="list-style-type: none"> • Partitioning hard disk (primary and extended partitions) 	<ul style="list-style-type: none"> • What's Inside a Hard Drive? • How Hard Disks Work • Inside: Hard Drive Motherboard 	Diagram of a Hard disk, diagram of internal components and structure.	Calculation of Hard disk capacity, Read/write time, latency time, seek time.

	<ul style="list-style-type: none"> • Hard Drive Failures • How To Troubleshoot a Noisy Hard Drive • How to Format a Hard Drive • How to Completely Erase a Hard Disk Drive • Installation and configuration of storage devices. Integration of PATA and SATA drivers. • Recover emails, files, and data from a crashed hard drive or computer <p><u>Virus Removal</u></p> <ul style="list-style-type: none"> • How to run a full system scan • How to fix your browser from redirecting to other websites (browser hijack) • Using a modern anti-virus utility • When utilities don't fix everything, how to manually remove a virus • 2 specific things to disable when trying to get rid of a nasty virus • 2 special utilities that work wonders 	<ul style="list-style-type: none"> • Desktop Hard Drive Buyer's Guide • What is RAID? Using Multiple Hard Drives for Performance and Reliability • Partitioning hard disk (primary and extended partitions) • Learn how to prevent your PC from getting malware • All the different types of malware and how they attack your PC <p>The difference between Anti-Virus and Anti-Spyware software</p>		
20	<p><u>System Utilities</u></p> <ul style="list-style-type: none"> • How to check to see if your hard drive has bad sectors • Fix the master boot record • How to run an in-place installation • Using Task Manager and event 	<p>Bad Sectors in Hard disk, Master Boot Record, in-place installation, Registry fixing, performance level check, Shortcut fixing, Fixing Startup process, log, etc.</p> <p>Users and user account. Privileges, scope, permissions etc. Concept of Virtual</p>	<p>Pin diagram and block diagram of RAM, ROM, EPROM, Dynamic ROM Chips.</p>	<p>Definition of Scalar and Vector, notations.</p>

	<p>viewer.</p> <ul style="list-style-type: none"> • Using System Monitor and Performance Logs. • Configure config.sys file. <p><u>User Account Customization</u></p> <ul style="list-style-type: none"> • How to create and configure user accounts in Windows XP, Vista, 7/8 • Make Changes to an Account • Changing the storage location of the personal folders • Changing the storage location of installed software • Setting up Parental Controls in Windows XP, Vista, 7, 8 • How to Use Fast User Switching in Windows • View Hidden Files and Folders • Lock Down Windows 7 / 8 With User Account Control • How to Delete User Accounts in Windows 	<p>Machine.</p>		
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21	<p><u>Windows Update & Device Driver</u></p> <ul style="list-style-type: none"> • How to find your system version in Windows, Linux • Installing a service pack • How to perform a Windows Update <p><u>Software Installation</u></p> <ul style="list-style-type: none"> • Installing a software program in windows • How to run a file from MS-DOS • Extracting or uncompressing a compressed file • How to compress or make files into one file • Extracting files from the Windows cabinets • Uninstalling Windows software • Unable to remove a program from Windows Add/Remove programs 	<p>Version of a software, Service pack, Updating of OS, Different configurations of Computer system and its peripherals, Compatible with different hardware/software.</p> <p><u>Software Installation</u> –</p> <p>Pre-installation - Prerequisites, Install procedure, Rollback or Uninstall procedure, Tests.</p> <p>Post-installation – Backup procedure & specifications, Restore procedure, Periodical view check.</p> <p>Awareness of legal aspects of using computers such as copyright, patent etc.</p>	Diagram of servo motor and stepper motor with external connections	Addition and subtraction of vectors.
22	<p><u>Installing Hardware Drivers</u></p> <ul style="list-style-type: none"> • How To Update Drivers in Windows • How To Roll Back a Driver in Windows • Familiarization with Device manager. • Interfacing with cellphone, tablet PC, synchronization of contacts. 	<ul style="list-style-type: none"> • What is a Driver? • What hardware device drivers should be updated • What is a Device manager? <p>• Computer Maintenance Tips and Tricks to Backup, Scan and Clean</p> <p>Power on self test, Peripheral diagnostics, general purpose diagnostics, Operating system diagnostics. Hardware boot process, Windows boot process.</p>	Top view of a motherboard showing chip set and slots etc.	Scalar and cross product. Simple problems

	<p><u>Windows Utilities</u></p> <ul style="list-style-type: none"> • How to Repair Corrupted Files Problems • How to check for corrupted files • Restore your machine back to normal • Hard disk is filling up, what should one do? • Where's the disk space ? • Top 15 Ways to Speed Up the Computer • How to Automatically Clean and Organize the Desktop, Downloads, and Other Folders • 5 Simple Rules To Keep Files Organized • 5 Reasons - Computer Is Running Slow 			
23	<p><u>Junk File Removal</u></p> <ul style="list-style-type: none"> • How to Remove Junk Files • How to completely remove "deleted" files • How to clear web browser cache firefox, ie, chrome, • 5 steps to clean up your computer files • Personalize your Windows XP-based PC <p><u>Linux OS</u></p> <ul style="list-style-type: none"> • Using a Linux Live CD • Why you want a Linux Live CD • Use Ubuntu Live 	<p>Junk files, deleted files, configuration of internet browser.</p> <ul style="list-style-type: none"> - Introduction to UNIX/LINUX and its structure. - Files and Processes in Linux. - Directory structure of Linux O.S. <p>Outlook – Add and use contacts, Calendar basics, Recall and replace sent messages, Send automatic replies when you're out of the office, The ins and outs of BCC, Use Instant Search to find</p>	<p>Diagram of different connectors, CPU sockets.</p>	<p>AC circuits: Power, VA, KVA, Watts, KW, related exercise, power factor.</p>

	<p>CD to Backup Files from Your Dead Windows Computer</p> <ul style="list-style-type: none"> • Using a liveCD as your Linux Desktop <p><u>Outlook Configure & Backup</u></p> <ul style="list-style-type: none"> • Configure outlook • Backup and Restore Outlook • How to restore the Outlook default installation, toolbars and settings • Restore Deleted Items from an Outlook PST-file 	<p>Calendar items, Use Instant Search to find contacts, Use Instant Search to find messages and text, Add holidays to your calendar, Create or delete a search folder, Import and export vCards to Outlook contacts, Make the switch to Outlook 2013, Reach out with contact groups (distribution lists), Send or delete an email stuck in your outbox, Take calendars to the next level, Track email with read receipts, Password protect your mailbox, Use rules to manage your email.</p>		
24	<p><u>Laptop PCs :</u></p> <ul style="list-style-type: none"> • Identification of laptop sections and connectors. • Assembling and disassembling a Laptop. • Checking of various parts of a laptop. • Checking of batteries and adaptors. • Replacing different parts of laptops. • Upgrading RAM, HDD and other parts. • Testing, fault finding and troubleshooting techniques. • POST codes and their meaning, fixing of problems based on codes. • Enabling support for SATA technology. • Installation of OS 	<ul style="list-style-type: none"> • Introduction of laptop and comparison of various Laptops. • Block diagram of laptop & description of all its sections. • Study of parts of a laptop. • Input system: Touchpad, Trackball, Track point, Docking station, Upgrade memory, hard disk, replacing battery, Configuring wireless internet in a laptop, • Latest Tools & Gadgets For Desktop/Laptop Repairs 	<p>Front and Rear view of a Laptop PC.</p>	<p>Diodes: Rectifier, peak voltage, PIV, Rectifier efficiency.</p>

	<p>using SATA technology drivers.</p> <ul style="list-style-type: none"> • Laptop troubleshooting • Latest Tools & Gadgets For Desktop/Laptop Repairs 			
25	<p><u>Word Processing & Spreadsheet Software:</u></p> <p>a) Creating and saving document files using Word Processing Software.</p> <p>b) Formatting text and editing.</p> <p>c) Setting page and margins. Tabs and indents.</p> <p>d) Creating multicolumn documents.</p> <p>e) Inserting pictures in documents.</p> <p>f) Creating tables.</p> <p>g) Creating different types of documents.</p> <p>h) Saving word documents in other formats.</p> <p>i) Mail merge.</p> <p>j) Printing documents.</p> <p>k) Creating Worksheets using Spreadsheet Software.</p> <p>l) Formatting cells.</p> <p>m) Using formula in cells.</p> <p>n) Creating simple spreadsheet for an application.</p> <p>o) Creating relation between</p>	<p>a) Introduction to word processing and comparison of features. Creating and saving document files using Word Processing Software.</p> <p>b) Formatting text and editing.</p> <p>c) Setting page and margins. Tabs and indents.</p> <p>d) Creating multicolumn documents.</p> <p>e) Inserting pictures in documents.</p> <p>f) Creating tables.</p> <p>g) Creating different types of documents.</p> <p>h) Saving word documents in other formats.</p> <p>i) Mail merge.</p> <p>j) Printing documents.</p> <p>k) Introduction to spread sheet. Creating Worksheets using Spreadsheet Software.</p> <p>l) Formatting cells.</p> <p>m) Using formula in cells.</p> <p>n) Creating simple spreadsheet for an application.</p> <p>o) Creating relation between sheets.</p> <p>p) Graphs and tables.</p> <p>q) Advanced features.</p> <p>r) Printing spread sheets.</p>	<p>Flow charts showing steps in sample programs.</p>	<p>Voltage regulators, Voltage doublers, multipliers, Clipper circuits, related exercise.</p>

	sheets. p) Graphs and tables. q) Advanced features. r) Printing spread sheets.			
26	EXAMINATION			

**Syllabus for the Trade of
 “COMPUTER HARDWARE & NETWORK MAINTENANCE”
 Under CTS**

Semester – II

Duration : 6 months

Week No.	Practical	Theory	Engineering Drawing	Workshop Sc. & Cal.
27	<u>Linux operating system</u> - Installing UNIX / LINUX - Preparing functional system UNIX/LINUX - Adding new users, software, material components - Making back-up copies of the index and files - Dealing with the files and indexes	<u>Linux operating system</u> - Basic Linux commands. - Linux file system, The Shell, Users and file permissions, vi editor, X window system, Filter Commands, Processes, Shell Scripting.	Use of drawing instruments, ‘T’ square, drawing board, construction of simple figures & solids with dimensions, use of different types of scales in inch & millimeters, lettering numbers & alphabets. Diagram of Linux file system.	Entrepreneurship and financial assistance from financial institutions.
28-30	<u>Printers & Plotters</u> a) Testing front panel controls. Interface pins, cables, measurement of voltages and waveforms. b) Installing a printer and carrying self- test.	a) Types of printers, Dot Matrix printers, laser printer, Ink jet printer, line printer. Block diagram and function of each unit head assembly, carriage, and paper feed mechanism. Front panel controls and interfaces. Pin details of interface port. b) Installation of a printer	Block diagram of different types of printers. Showing various functional units	Selection, Estimation of time and spares for servicing jobs.

	<p>c) Replacing ribbon in a DMP. d) Refilling ribbon tape of DMP. e) Testing and Rectifying defective cable. f) Removing and cleaning printer head. g) Replacing a new printer head. h) Testing and servicing Printer power supply. i) Changing rollers and other mechanical parts. j) Tracing the control board and identifying defective components. Servicing of control board. k) Replacement of toner cartridge of laser printers. l) Refilling toner cartridge of laser printers. m) Drum cleaning and replacement in of laser printers. n) Testing and servicing Printer power supply of laser printers. o) Changing mechanical parts of laser printers. p) Tracing the control board circuit and identifying defective components. Servicing of control board of laser printers. q) Replacement of ink cartridge of deskjet/inkjet printers. r) Refilling ink cartridge of</p>	<p>driver. And self test. c) Ribbon types used. d) Refilling of ribbons. e) Printer cable testing defects, effect and servicing. f) Printer head, types, cleaning procedures. g) Precaution to be taken while removing and replacing printer head assembly. h) Pinter power supply, circuit analysis, defects, servicing. i) Carriage motor assembly, paper feed assembly, sensors . Procedure for dismantling and replacing mechanical parts. j) Printer control board, circuit, function, probable defects, servicing. k) Working principle of LASER printer. l) Toner cartridge, types, replacing toner cartridges m) Refilling toner cartridges, equipment available for refilling and procedure. n) Printer drum, function, cleaning and replacing procedure. o) Power supply in laser printers, circuit, defects, servicing. p) Mechanical parts and sensors on laser printer, function, replacement procedure. q) Control board(s) in laser printer, circuit diagram, defects and servicing procedure. r) Working principle of INK JET/Deskjet printers. Type of ink used and replacement of ink cartridge. s) Refilling of ink, equipment available, quality of refilled cartridges. t) Printer drum, function, cleaning and replacing procedure. u) Power supply in inkjet</p>		
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	<p>deskjet/inkjet printers.</p> <p>s) Drum cleaning and replacement in deskjet/inkjet printers..</p> <p>t) Testing and servicing Printer power supply of deskjet/inkjet printers..</p> <p>u) Changing mechanical parts of deskjet/inkjet printers..</p> <p>v) Tracing the control board and identifying defective components. Servicing of control board of deskjet / inkjet printers.</p> <p>w) Connecting and using high speed line printers.</p> <p>x) Replacing spares of line printers.</p> <p>y) Self test procedures in printers.</p> <p>Use of diagnostics software for serving printers.</p>	<p>printers, circuit, defects, servicing.</p> <p>v) Mechanical parts and sensors on inkjet printer, function.</p> <p>w) Working principle of Plotter and its common faults.</p>		
31-32	<p><u>Scanner & MFD</u></p> <p>Scanner – Installation, configuration, using Automatic Document Feeder(ADF), OCR.</p> <p>Barcode Scanner – Installation and configuration.</p> <p>Network Scanner – Installation and configuration.</p> <p>Troubleshooting of Scanner.</p> <p>Multifunction Printer – Installation, Replacing supplies and spares, troubleshooting,</p>	<p>Working principles of Scanner, Barcode Scanner, Network Scanner.</p> <p>Working principles of Multifunction Printer, Passbook printer, High Speed Printer, Line Printer, Network Printer.</p> <p>Print Server.</p>	<p>Block diagram of different types of Scanners and MFDs. Showing various functional units</p>	- Do -

	<p>Passbook Printer – Installation, calibration, configuration & troubleshooting. Replacement of Supplies and maintenance.</p> <p>Network Printer – Installation and configuration, troubleshooting.</p> <p>How to update the flash of Motherboard, printer, scanner and modem etc.</p>			
33	<p><u>Components of the Computer Network.</u></p> <p>Familiarization with various Network devices, Connectors and Cables.</p> <p>Understanding the Layout of network.</p>	<p>Introduction to Computer Networks – Advantages of Networking, Peer-to-Peer and Client/Server Network.</p> <p>Network Topologies – Star, Ring, Bus, Tree, Mesh, Hybrid.</p> <p>Type of Networks – Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN) and Internet, Ethernet, Wi-Fi, Bluetooth, Mobile Networking, Wire and wireless Networking.</p> <p>Difference between Intranet and Internet.</p>	<p>Block diagram of different types of network and network devices.</p> <p>Block diagram of different network topologies.</p>	<p>Quality control standard and institutions.</p> <p>Warranty & Guarantee and their differences.</p>
34-35	<p><u>Crimping & Punching</u></p> <p>Crimping practice with straight and cross CAT 5 cables.</p> <p>Punching practice in IO Box and patch panel.</p> <p>Crimping and making cables.</p>	<p>Communication Media & Connectors – Unshielded twisted-pair (UTP), shielded twisted-pair (STP), Fiber Optics and coaxial cable: RJ-45, RJ-11, BNC.</p> <p>Understanding color codes of CAT5 cable. 568A and 568B convention.</p>	<p>Diagram of different Network cables and connectors.</p>	<p>Standards of Cables and connectors.</p>
36	<p><u>Cabling</u></p> <p>Create cabling in a lab with HUB/Switch and IO Boxes and patch panel. Fitting Switch Rack.</p>	<p>Introduction to Data Communication – Analog and Digital Signals, Simplex, Half-Duplex and Full-Duplex transmission mode.</p>	<p>Diagram of different tools to setup a computer network.</p>	<p>Calculation of Network Speed. Bandwidth, Baud Rate, Half Duplex and full duplex.</p>

37	<u>Install & configure a Network.</u> Installing & Configuring a Peer-to-Peer Network using Windows Software. Making cables by crimping. Connect computers using Bluetooth.	OSI Model - The functions of different layers in OSI model	Diagram of OSI layers.	Layer wise network equipment, accessories and protocols.
38-39	<u>Configuration of Data communication equipments.</u> Connecting computers with Network with Drop cable and using Wi Fi configuration. Basic Programmable switch Configuration Spanning Tree Protocol (STP) Command Line Interface IP Routing Process Verifying Configuration	Network Components – Modems, Firewall, Hubs, Bridges, Routers, Gateways, Repeaters, Transceivers, Switches, Access point, etc. – their types, functions, advantages and applications. IP Routing in Network RIP IGRP	Diagram of a basic and advanced wi-fi network.	Protocols, transmission and reception process, speed.
40	<u>IP Addressing & TCP/IP</u> IP Addressing technique(IP4/IP6) and Subnetting and Supernetting the network. Installation and Configuration of TCP/IP Protocol. Practice TCP/IP Utilities : PING, IPCONFIG, HOSTNAME, ROUTE, TRACERT etc.	Protocols, TCP/IP, FTP, Telnet etc., Theory on Setting IP Address(IP4/IP6) & Subnet Mask, Classes of IP Addressing.	Diagram of subnet and supernet.	IP Addressing and subnetting.
41	<u>Other Network Protocols</u> Working with SMTP, TELNET, FTP, HTTP, SNMP, LDAP etc. Practice on configuring DHCP.	Simple Mail Transfer Protocol (SMTP), Telnet, File Transfer Protocol (FTP), Hyper Text Transfer Protocol (HTTP), Simple Network Management Protocol	Block diagram of different types of internet protocol system.	- Do -

		(SNMP). LDAP(Lightweight Directory Access Protocol). Introduction to Network Security. Concept of Dynamic Host Control Protocol.		
42-43	<u>Sharing Resource & Internet connection.</u> Sharing Resource and Advance Sharing Setting. Installing Proxy Server. Exposure and using Internet. Setting E-mail accounts. Conferencing. Installing and Configuring Internet Connection on a PC using Broadband or Dongle.	Concept of Internet. Architecture of Internet. DNS Server. Internet Access Techniques, ISPs and examples(Broadband/Dialup/Wifi). Concept of Social Networking Sites, Video Calling & Conferencing. Concept of VIRUS and its Protection using Anti Virus, UTM and Firewall.	Diagram of distributed networking.	DSL Speed Calculation.
44	<u>Network Protection and troubleshooting.</u> Setting up basic protection using public keys and MAC address filters. Integrate wired with wireless network. Power over Ethernet(PoE). Troubleshooting wired and wireless network.	Collaborating using wired and wireless networks, Protecting a Network, Network performance study and enhancement.	Schematic diagram of network models with different configuration	Standards of Wi-fi Network. Antenna and its types.
45	<u>Control & monitoring of network devices.</u> Setting up of basic collaboration tool like NetMeeting for activities like chat, application sharing, remote desktop access and control, VoIP. Setup IP camera for basic surveillance scenario, logging and monitoring of devices / locations. Use Linux Network Tools to check / maintain / Manage	Surveillance using network devices, collaboration on network for team optimization and support activities. Remote management of devices.	Block Diagram of Surveillance System.	Industrial Acts.

	Network.			
46-47	<p><u>Install and configure Windows Server</u></p> <p>Configure services like Active Directory, DNS and DHCP.</p> <p>Configuration of broadband modem and sharing internet connection.</p>	<p>Server concepts, Installation steps, configuration of server.</p> <p>Concept of Active Directory and DNS.</p> <p>Setting up of DHCP, Routing and remote access.</p>	Diagram of a Centralised Networking, Client-Server network diagram.	Data communication Techniques. CSMA / CD.
48	<p><u>Network Security</u></p> <p>Practice on firewall technologies to secure the network perimeter.</p> <p>Practice LAN security considerations and implement endpoint and Layer 2 security features.</p> <p>Wi-fi configuration to implement security considerations.</p>	<p><u>Network Security</u></p> <p>Modern Network Security Threats and the basics of securing a network.</p> <p>Secure Administrative Access, LAN security considerations.</p> <p>Cryptography.</p> <p>Wi-fi security considerations.</p>	Various symbols of Networking.	Data Encryption and Decryption Techniques.
49	<p><u>Internet and Web Browser</u></p> <p>Practice web browsing using popular web browsing software, Configuring web browser.</p> <p>Search for content using popular search engines.</p> <p>Use favourite folder for browsing quickly.</p> <p>Downloading & Printing Webpages.</p> <p>Using e-mail – Opening & configuring email client, mailbox: inbox and outbox, Creating and sending e-mail, Replying to an e-mail message, Forwarding and e-mail message, Sorting and searching emails.</p>	<p><u>Internet and Web Browser</u></p> <p>World wide web and website Web Browsing and popular web browsing software.</p> <p>Introduction to Search Engines, Popular Search engines.</p> <p>Concept of Favourites Folder.</p> <p>What is an Electronic Mail. Email Addressing, BCC and CC, Inbox, Outbox, Address book, SPAM.</p> <p><u>IT Act & Law</u></p> <p>Introduction to Cyber Security.</p> <p>Introduction to Cyber Laws & IT Act.</p> <p>Importance of privacy and techniques to manage it.</p>	Block diagram of WAN.	Concept of Asynchronous & Synchronous Transmission.

	<p>Sending document/softcopy by email, activating spell checking, using address book, Handling SPAM, Removal of Cookies.</p>			
50	<p><u>Project Work (any one)</u> a) Disassemble a given Desktop / Laptop PC totally following the safety precautions. b) Reassemble the Desktop / Laptop PC and test for its satisfactory performance. c) Install Operating System and necessary driver, taking backup and restore system. d) Rectify a defective system and make it as smooth working system. e) Troubleshoot / Repair / Replace an SMPS/RAM. f) Check Hard disk error, partition, format different types of Hard disk drives.</p>	<p>ITIL V3 Practices for Service Management – Service Management Concepts – Introduction, Service Strategy (SS), Service Design (SD), Service Transition (ST), Service Operations (SO), Continual Service Improvement (CSI).</p>	<p>Diagram related with Project</p>	<p>Calculation & Science related with Project.</p>
51	<p>Root Cause Analysis(RCA) – Definition, Four major steps – Data collection, causal factor charting, root cause identification, recommendation generation and implementation. Root cause map, Root cause summery table. Cause & Effect diagram (fishbone diagram), 5 why's or Gemba Gembutsu.</p>	- Do -	- Do -	
52	EXAMINATION			

TRADE : “COMPUTER HARDWARE & NETWORK MAINTENANCE”

LIST OF TOOLS AND EQUIPMENT

A. TRAINEES TOOL KIT FOR 20 TRAINEES +1 INSTRUCTOR

SI.No	Specification	Quantity
1	Connecting screwdriver 100 mm	21 nos.
2	Neon tester 500 V.	21 nos.
3	Screw driver set (set of 5)	21 nos.
4	Insulated combination pliers 150 mm	21 nos.
5	Insulated side cutting pliers 150 mm	21 nos.
6	Long nose pliers 150 mm	21 nos.
7	Soldering iron 25 W. 240 V.	21 nos.
8	Electrician knife	21 nos.
9	Tweezers 100mm	21 nos.
10	Digital Multimeter	21 nos.
11	Soldering Iron Changeable bits 15 W	21 nos.
12	De- soldering pump	21 nos.

B. LIST OF TOOLS REQUIRED

SI.No	Specification	Quantity
1.	Crimping tool (pliers)	2 Nos.
2.	Soldering Iron 25W	6 Nos.
3.	Magneto spanner set	2 Nos.
4.	Screw driver 150mm	4 Nos.
5.	Steel rule 150mm	2 Nos.
6.	Scriber straight 150mm	2 Nos.
7.	Soldering Iron 240W	1 Nos.
8.	Allen key set (set of 9)	2 Nos.
9.	Tubular box spanner (set of 6nos)	1 No
10.	Magnifying lenses 75mm	3 Nos.
11.	Continuity tester	6 Nos.
12.	Soldering iron 10W	6 Nos.
13.	Cold chisel 20mm	1 No.
14.	Scissors 200mm	1 No.
15.	Handsaw 450mm	1 No.

B. Tools & Equipments

Tools and Equipment: (Computer Hardware: Installation and Maintenance)		
SI. No.	Name of the Equipment	Qty
HARDWARE		
1	Server Computer	01 no

3	Desktop Computer	10 nos
4	Laptop, Notebook	01 each
5	Intel Mobile Desktop based PC with LCD monitor	01 no
6	Printers: Laserjet, deskjet, passbook, mfd	01 each
7	Network Printer	01 no
9	5KVA online UPS	02 nos
10	LAN Cards, Wi-fi LAN Cards	06 nos each.
11	LCD/DLP Projector	01 no
12	Power Meter	02 nos
13	Crimping Tools	06 nos
14	Computer Toolkits	06 Nos.
15	Computer Spares:	As required
16	Motherboards (of different make)	4 nos
17	Cabinets	4 nos
18	Processors (of different make)	4 nos
19	Hard Disk (500 GB or better)	4 nos
20	Optical Drives	4 nos
21	LCD/LED Monitors	2 nos
22	Pen Drives	4 nos
23	External Hard disk	2 nos
24	External DVD Writer	2 nos
25	Keyboards	4 nos
26	Mouse	4 nos
27	Anti static pads	4 nos
28	Anti static wrist wraps	4 nos
29	SMPS	4 nos
30	Digital Multimeters	10 nos
31	Blu-Ray drive and player	2 nos
32	External Hard Disk	2 nos
34	Digital Camera	2 nos
35	HD Display	2 nos
36	Network storage	2 nos
37	Card Reader	2 nos
38	Game video card	2 nos
39	Web Cam	2 nos
40	Surround sound speakers	2 nos
42	Different types of memory cards	2 nos each
43	Laptop kits	12 nos
44	Laptop spares: Cabinet with display, memory, hard disk, battery pack, keyboard membrane, chargers	As required
47	SMPS Trainer kit	2 nos
48	UPS Trainer kit	2 nos
49	Power electronics Trainer kit	2 nos
50	Post error debugging card	4 Nos
51	SMPS Tester	4 Nos.
52	PCI slot Testing tool	4 Nos.

SOFTWARE

1	Windows Server Operating System	2 licenses
2	Windows Operating System	2 licenses
3	Linux Operating System	2 nos.
4	Network Management Software	01 No.

5	MS Office	2 nos
6	Anti virus software	2 nos
7	Data recovery software	2 nos
FURNITURE and Other Equipments		
1	Computer Tables	10 nos
2	Computer Chairs	20 nos
3	Printer Table	1 no
4	Class room chairs	20 nos
5	Air conditioners (optional)	2 nos
6	Scanner	1 no
7	Modem	1 no
8	Telephone Line	1 no
9	Broadband Internet connection	1 no
10	Fire fighting equipments	As required
11	Hardware and Network Trainer Kit	6 nos

C.Tools & Equipments

(Computer Networking)		
Sl. No.	Name of the Equipment	Qty
HARDWARE		
1.	Wireless Network Adapter	10 nos
2.	Wireless Access Point	6 nos
3.	Router	6 nos
4.	Managed Layer 2 Ethernet Switch 24 port	2 nos
5.	Managed Layer 3 Ethernet Switch 24 port	2 nos
6.	Network Training System	2 nos
7.	LAN Protocol Simulation and Analyser Software	2 nos
8.	Network and Internet security trainer	2 nos
9.	LAN cable tester	2 nos
10.	Network cables – UTP	As required
11.	Network Cables – coaxial, flat, ribbon	As required
12.	LAN Cards, wi-fi LAN Card	05 nos each
13.	Connectors for cables	As required
14.	Power Meter	2 nos
15.	Media Convertor	4 each
16.	24 port UTP jack panel	2 nos
17.	SC Couplers	12 nos
18.	SC Pigtails	12 nos
19.	RJ-45 connector	As required
20.	Fluke Meter	2 nos
21.	Crimping Tools	6 nos
22.	Switch with POE ports	2 nos
23.	POE adapters	2 nos
24.	Network Camera (Outdoor / Indoor)	2 no each
25.		

Raw materials		
1.	White Board Marker	1 Dozens
2.	Duster Cloth(2' by 2')	20 Pcs
3.	Cleaning Liquid 500 ml	2 Bottles
4.	Xerox Paper (A4)	As required
5.	Full Scape Paper (White)	1 reams
6.	PCB, solder flux etc & electronic components	As required
7.	Wires, cables Plug sockets switches of various types and other consumables	As required
8.	Resistors, Capacitors, Inductors, Diodes, LED, Transistors, Thyristors, ICs etc.	As required
9.	Spare Transformers and power devices required for servicing SMPS	As required
10.	Various types of Button Cells	As required
11.	Dry Cell	As required
12.	Hand Brush	As required
13.	Silicon grease	As required
14.	Heat sink agent	As required
15.	RAM 512 MB	As required
16.	Cartridges for printer	As required
17.	Optical Mouse P/S2 or USB	As required
18.	P/S2 OR USB Key Board	As required
19.	SMPS	As required
20.	CMOS Battery	As required
21.	3 Pin Power Chord	As required
22.	Cat 5/5e/6 cable	300 meters

23.	Flat Cable	100 meters
24.	Stapler Small	2 pcs
25.	Stapler Big	1 pcs
26.	AAA battery for remote	As required
27.	AA battery for clock	As required
28.	8 GB pen drives	4 Nos
29.	CDs	20 Nos
30.	DVDs	10 Nos.
31.	Wall Clock	1 pcs
32.	Anti static pads	As required
33.	Anti static wrist wraps	As required
34.	Soldering wire and paste	As required
35.	RJ – 45 Connector	As required
36.	Telephone cable	As required
37.	Co-axial cable	As required
38.	RJ-11 connector	As required
39.	BNC connector, T connector, terminator	As required
40.	Keystone jack	As required
41.	Patch / Jack Panel	As required
42.	Patch / Mounting cord	As required
43.	RJ-45 Info outlet with faceplate	As required
44.	RJ-45 I/O Box	As required
45.	RJ – 45 Cable extender	As required

46.	8-port HUB	04 Nos.
47.	LAN Card	04 Nos.
48.	Wi-fi LAN Card both PCI and USB	02 Nos.each