MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION   EXAMINATION, MUMBAI

| 1 | Name of Syllabus | **LICENTIATE  IN  COMPUTER  HARDWARE  MAINTENANCE   (LCHM) ( 301202)** |
|---|---|---|
| 2 | Max.Nos of Student | 25  Students |
| 3 | Duration | 1 year |
| 4 | Type | Part Time |
| 5 | Nos Of Days / Week | 6 Days |
| 6 | Nos Of Hours /Days | 4 hrs. |
| 7 | Space Required | 1)  Workshop   =   200   sqfeet <br> 2)  Class Room =    200   sqfeet <br> TOTAL       =   400  sqfeet |
| 8 | Entry Qualification | S.S.C Passed |
| 9 | Objective    Of    Syllabus/ introduction | To prepare a student to – <br> (1) Explain Operation of PC systems. <br> (2) Installation nod up graduation of PC system. <br> (3) Preventive maintenance of PC. <br> (4) Card level fault diagnosis in PC. <br> (5) Fault diagnosis in peripheral Devices such as Keyboard, Monitors, and Printers. <br> (6) Tackle virus problems. |
| 10 | Employment Opportunity | The may start his own Business / May get job in Establishment |
| 11 | Teacher's  Qualification | Diploma in Electronics / Computer |
| 12 | Training  System | **Training System Per Week** |

Training System Per Week (item 12):

| Theory | Practical | Total |
|---|---|---|
| 6hrs | 18hrs | 24hrs |

Exam. System (item 13):

| Sr. No | Paper Code | Name of Subject | TH/ PR | Hrs | Max. Mark | Min. Mark |
|---|---|---|---|---|---|---|
| 1 | 30120211 | Basic Electronic & Digital Technique | TH-1 | 3 Hrs | 100 | 35 |
| 2 | 30120212 | Microprocessor & Peripheral device | TH-2 | 3 Hrs | 100 | 35 |
| 3 | 30120213 | Computer hardware maintenance | TH-3 | 3 Hrs | 100 | 35 |
| 4 | 30120221 | Basic Electronic & Digital Technique | PR-1 | 3 Hrs | 100 | 50 |
| 5 | 30120222 | Microprocessor & Peripheral device | PR-2 | 3 Hrs | 100 | 50 |
| 6 | 30120223 | Computer hardware maintenance | PR-3 | 3 Hrs | 100 | 50 |
| | | **TOTAL** | | | **600** | **255** |

**SYLLABUS   PAPER - I**        BASIC ELECTRONIC & DIGITAL TECHNIQUES

1. SEMICONDUCTOR DEVICES & APPLICATIONS :-
Fundamentals of AC & DC theory and passive components (R,C,L)
Semiconductor Devices (Active components): -
Study of diodes- Junction diode, Zener diode, Scotty diode and Light Emitting Diode (LED) Study of
Transistors- NPN & PNP basing methods Study of ICs- concept of SSI, MSI, LSI, VLSI.

2. APPLICATION OF SEMICONDUCTOR DEVICES :-
Died as rectifier, Zener diode as a voltage stabilizer, Transitory as a switch, Transistor as an Amplifier,
Transistor as an Oscillator (LC, RC, Crystal oscillators only)
3. OPERATION AMPLIFIER 741, 555 TIMER VOLTAGE REGULATOR ICS: - Introduction & block
diagram study of 741, 555, 7805, 7905 study of simple application of 741, 555 and 7805.

4. BASIS OF DIGITAL ELECTRONICS
Study of Number System: - Binary, BCD, Hexadecimal and ASCII code.
Study Logic Gates: - OR, AND, NOT, NOR, NAND, EX-OR, EX-NOR, NAND gate as universal gate, Binary
Adder, Subtract or (Half and Full adder and subtract or and study of IC 7483).
Study of Logic Families: - TTL, CMOS, ECL
Study of FLIP FLOP: - S-R, D, T, J-K MS using gates.
Study of FFICs Like 7474, 7473/ 7476.
Study of Counters: - 4 bit binary counter (up & down).
Using flip flop, study of Ring and Johnson counter
Using Flip Flop Study of ICs like 7490, 7493 and 7193.
Study of Shift Register using Flip Flops, Serial & Parallel.
Study of shift registers ICs like 7164, 74165.

5. DIGITAL TECHNIQUES :-
Combination Logic circuits :- Encoder, Decoder, Multiplier Demultiplexer, parity Generator & Checker, Study
of ICs 7151, 74138, 74147, 74280.
Timing circuits: - Characteristics of a digital clock Pulse duration, pulse width, duty cycle, Mono stable and
stable multivibrator using gates, study of IC 74121.

6. MEASURING AND TESTING INSTRUMENTS :-
Study of front panel and operation of DMM and CRO study of Logic Probe and Pulsar, Logic Analyzer (basic
concept of Logic analyzer only is expected.

7. SWITCH MODE POWER SUPPLY :-
Basic principles & operation of SMPS power supply SMPS used in computer systems, out put voltage, capacity,
cable colour cod and connecters. Power good signal. Common faults in SMPS.

8. Fundamentals A/D & D/A converters (ADC: -
   8 bit ladder net work type Study of ADC IC 0809 and DAC: - 8 bit ladder net work type study of ADC IC
0808. Electronics display: - 7 segment display, LCD, LED, matrix Plasma Display.

**PRACTICALS - 1  BASIC ELECTRONIC & DIGITAL TECHNIQUES**

1)        Assemble & Test Full Wave Rectifier with 7805 stabilizer.
2)        Assemble & Test Transistor as A Switch.
3)        Assemble & Test Crystal Oscillator.
4)        Assemble & Test Op-Amp As An Amplifier (Inverting / Non inverting)
5)        Assemble & Test 555 as an Astable Multivibrator.
6)        Assemble & Test Logic Gates.
7)        Assemble & Test Logic Probe.
8)        Study of Digital Multimeter. & Measure A.C. & D.C. Voltage, Current & Resistance
9)        Study of Oscilloscope. & Measure A.C. & D.C.Voltage & Frequency

10)     Assemble & Test Flip flops (S-R, D and J-K, 7474, 7478 / 7473).
11)     Assemble & Test Counters (7490, 74193).
12)     Assemble & Test shift Registers (4164, 7495).
13)     Assemble & Test Adder 7483
14)     Assemble & Test Tri. Stated Buffer 74125
15)     Assemble & Test Memory IC 7489
16)     Study of Diode Matrix Rom.
17)     Assemble & Test seven segments Decoder Driver Using Lts542 Display IC 7447 And Lts542 /543
        Display.
18)     Assemble & Test Dac 0808
19)     Assemble & Test Adc 0809
20)     Assemble & Test Multiplexer And Demultiplexer (74157, 74138)
21)     Assemble & Test parity Checker (78180)
22)     Assemble & Test Testing of Smps for Pc.
23)     Simple Faults in Smps.


**PAPER-2  Microprocessor  & Peripheral  device**

 1)  MICROPROCESSORS :-
Introduction to microprocessors, study of architecture. Instruction set, programming and interfacing of 8085 microprocessors, (Programmers to compliment, Add, Subtract Multiply only are expected)
Block diagram level study of 8253, 8255, 8251, 8271 or 8272, 8237, 8259, 6845 Interfacing concept of these chops with 8085 (Detailed study and block diagram of this chop and writing programmed to interfaces this chip are not expected.)

2) COMPUTER MEMORIES
Basics of semi conductor memories, Static RAM, Dynamic RAM, ROM, PROM, EPROM, STUDY of ICs 7489, 4116, 7488, 74186, 2716.
 Memory requirements (Primary) memory mapping, conventional (base memory, upper memory area, area, extended Emory, expanded memory, shadow memory, Types of RAM, types of memory modules cache memory.

3) FLOPPY DISK DRIVE:- Floppy disk driver types, size capacity Floppy disk components (Read/write head, head actuator, speculate motor, circuit board, sensors, cable connectors, jumpers faceplate)
Floppy Disk construction (Jacket, Recoding media, label area drive hub hole, index hole alignment hole, read/write window protection shutter), Formatting of Floppy Disk, Fad interface Installation, preventive maintenance & trouble shooting of FDD.

4) HARD DISK DRIVER :-
Classification as per physical size, stronger capacity, type of inter face used, Writing format, HDD components Interface with SCSI, DE, SAATA, PATA, Hard Disk installation procedure, Controller configuration, system configuration. Formatting and partitioning using DOS. Formatting using Advanced disk management software. Disk hardware and software limitations, ROM BIOS capacity limitations and OS limitations. Preventive maintenance of HDD. Trouble shooting of HDD using Hardware and software tools. Testing of HDD using diagnostic software.
Introduction Installation to pen Driver and Zip Drives.

5) VIDEO DISPLAY UNIT : -
CTR study, TV theory concept, classification of picture tube, type of input, resolution, persistence, type of scanning (of both Along and Digital monitors)
Block diagram of Monochrome monitor, study of power supply scanning and sync and video out put sections. Overview of ICs used common faults and its rectification, adjustment size, brightness focus etc.
Block diagram of colour monitor, colour theory, colour picture tube, common faults and its rectification.
Study of multisync VGA & super VGA monitor, specifications of VGA, Study of Flat screen, TFT, Touch Screen, LCD Screen.

6) PRINTERS :-

Image formation method, Fully formed character printers Bit image printers, printing mechanism, impact and non-impact printers. Study of Dot Matrix Printer, Inkjet printer, Laser printer. (Print mechanism, different motors, sensors, printer electronics card)

Interfacing of printer of PC (Cantoning interface / USB Port) Installation Printers and printer sharer, configuring printer thought software for different operating modes.

Text Graphic condensed and enlarged (No theory question expected)

File spooling and background printing.

Installation of printer driver software, preventive maintenance common hardware problem and elimination.

7) KEYBOARD :-

Interfacing of switches to computer, Matrix keyboard interface, and role of micro controller (8048/8049) in keyboard interface, key bouncing and denouncing.

Type of keys used in computer keyboard. Types of computer keyboard: - Basic PCAT. Multimedia PS2, cordless keyboard.

Preventive maintenance of keyboard, common faults in keyboard and its rectification.

8) MOUSE :-

Type of Mouse: - Mechanical, Opt mechanical, Optical, cordless (Infra red and RF). Two button, three buttons, and scroll mouse, Trackball. Preventive maintenance, common faults and its rectification

9) ADVANCED PERIPHERALS :-

Study of MODEM, cable modem CD-ROM drive, CD writer Pen Drive, zip Drive web camera, Amplispeakers. Tape drive scanner, plotter.

**PRACTICAL – 2 Microprocessor & Peripheral device**

1) Familiarization of 8085 Microprocessor Trainer Kit.
2) Study of 8085 Assembly Language Programmers (Five Programs)
3) Physical Layout, Tracing And Testing of Monochrome
4) Simple Fault Detection And Testing of Colour Monitor.
5) Physical Layout And Testing of Colour of Colour Monitor.
6 Installations of Vga. / Svga Monitor.
7 Testing Monitor Using Software.
8 Simple Fault Detection And Rectification of colour Monitor.
9 Study of Printermechant (Mot Matrix / Ink Jet)
10 Study of Printer Electronics (Modular)
11 Study of Installation of Printer.
12 Self Test And Simple Printer.
13 Study of Floppy Disk And Floppy Disk Drive.
14 Installation and configuration of Floppy Disk Drive.
15 Simple Fault in Fdd.
16 Testing of Fdd Using Diagnostic Software.
17 Hard Disk Installation And Configuration, Formatting And Partitioning.
18 Trouble Shooting/ Testing Hdd Using had Diagnostic Software.
19 Studies of Keyboards.
20 Testing And Simple faults in Keyboards.
21 Installation of Mouse and it use.
22 Studies of Ups. Stabilizer and its Installation.
23 Studies of CD ROM Drive and DVD Drive.
24 Study of Modem (Internal / External).
25 Study of Scanner And /Web Camera.
26 Studies of Zip Drive And Pen Drive.
27 Study of Amplifire & speakers.

## PAPER – III  COMPUTER HARDWARE MAINTENANCE

1. ELEMENTS OF COMPUTER SYSTEM :-
   Block Diagram, History of computers, Basic Block diagram, classification, (micro computer, Mini Frame, supper mini, frame, super computer, Laptop, Palmtop) PC Architecture diagram.

2. MOTHERBOARDS & MOTHERBOARD COMPONENTS:-
   Types from Factor, layout of typical PC-AT motherboard Study of motherboard components, (processor, Processor socket/slot, memory chip, memory socket, ache memory COMS, RAM & RTC, CMOS Battery, ROM BIOS, Chipset, Bus slot connectors, I/O ports.

3. MICROPROCESSOR (TYPES AND SPECIFICATION) :-
   Brief history of 8086, 80286, 80386, 80486, 8087, 8089, 80287. (No question to be asked based or corporation of an above partition ICs. Processor specifications of P I, P II, PIII, P IV, Celeron, AMD Athol, Duran Comparison table stating click speed, register width, address bits, date bits, in, cache, maximum memory.

4 BUS SLOT :-
   Types of bus (address bus, data bus, control bus, system bus) Needs of expansion slots.
   Types of I/O buses:- PC bus, ISA bus, EISA bus, local bus VESA local bus, PCI bus, PCMCIA bus, AGP, USB.

5 ADD ON CARDS :-
   Display adapter cards: - Needs, Types, Overview of MDA, CGA, EGA, VGA, Study of VGA and SVGA, sound blaster and video blaster cards 2D and 3D accelerators, MODEM cards, T.V. Tuner card.

6. SYSTEM INSTALLATION AND CONFIGURATION: - Systems Resources: - Interrupt request (IRQ) IRQ connections IRQ assignments. Direct Memory access (DMA), DMA operation, DMA channels and assignments and priorities. I/O Addresses and assignment.
   Systems installation :- Motherboard ROMBIOS, Manufactures, Setup CMOS RAM, CMOS Setup, Standard and advanced Booting the system, cold boot, warm boot sequence POST, Booster trapping, error beeps, error codes, and error messages.

7. COMMUNICATION AND NETWORKING :-
   Concept of Port, Parallels Port, LPTI, Serial Port :- COMI and COM2, MODEM standards, internal and external MODEM installation, internet sharing, MDII networking:- Concept, needs, advantages of networking Types or networking:- LAN, WAN, MAN networking topologies:- Star Bus, Token ring, LAN cables, Different types interfacing cares, Installation IC. Client Server & Peer-to-Peer configuring Windows9x/me/2000 as peer/client server. Introduction to different network operating system.

8. STUDY OF OPERATING SYSTEMS :- Necessity of Systems Software, BIOS & OS, DOS Overview, commonly used dos commands, Internal commands, FORMAT, SYS, FDISK, Disco etc. Introduction to other operating systems like windows, UNIX, LINUX.

9. SYSTEMS UP GRADATION :-
Purpose of up gradation, area of up gradation: - Primary memory, secondary memory, Processor, Multimedia Capability, BIOS & OS, up gradation of software's.

10. SYSTEMS PREVENTIVE MAINTENANCE :-
Importance of preventive maintenance standard preventive maintenance schedule, power line problems, line noise, power surges and spikes, role of stabilizer, CVTs, spike busters isolation transformer, prevention of blackout and brownout role of UPS, off line UPS interactive UPS. Protection from dust, magnetic filed corrosion and temperature.

11. HARDWARE DEBUGGING TECHNIQUES :-
Hardware debugging :- Common hardware problems of system, motherboard component and peripherals, faults finding approaches, looking for physical damages, verification of cables and connectors, observing error beeps, error codes, error massages, localizing fault and rectification.

12. SOFTWARE DEBUGGING TECHNIQUES :-
Diagnostic software, Norton utilities, Norton, Disk Manager, Windows diagnostic Software.

13. COMPUTER VIRUSES AND ITS ELIMINATION :-
Type of virus, virus locations, effect, curing pretension vaccines.

## PRACTICALS -- III COMPUTER HARDWARE MAINTENANCE

1) Study of Physical Layout of PC – At System (Multimedia Setup)
2) Study of Cables, Connector, Switches and I/O Slots of P-I and above.
3) Study of various parts of PC – At Systems (P-I, P-II, P-III, P-IV).
4) Study of Motherboards of (P-I, P-II, P-III, P-IV).
5) Installation and configuration of Add on Cards (Video, Sound, LAN, Tuner Cards).
6) Study of LAN Components.
7) Study of Operation of File Server and Nodes.
8) Study of installation of Dos, Windows and Network.
9) Study of Routine Check up of PC/Preventive maintenance.
10) Fault finding And Rectification.
11) Study of Password Write Protect, Backup.
12) Study of Virus Preventive Software.
13) Study of Software Debugging and Diagnostic Software.
14) Study of up gradation.
15) PC Assembling Practice.
16) Installation of Dual Boot Operating System Such As Wins 98/Win XP / Win 200. Linux Windows.

LIST OF TOOLS & EQUIPMENTS :-

| Sr. No. | Description of Tools / Equipments | No. Required |
|---|---|---|
| 1. | PI, PII, PIII (any on e of them, Intel-celadon, PIV, PIV-HT etc or AMD Athol & Duron Each how | 03 02 |
| 2. | 8085 Microprocessor kit. | 02 |
| 3. | Spare set of Mother board / VGA, SVGA | 1 set |
| 4. | Spare set of floppy Drive/Keyboard and monitor CD, ROM Drive, DVD Drive, CD writer, Scanner, web camera, pen Drive. | 1 set |
| 5. | Printer (Dot Matrix) 80 column / Ink Jet, Lazar. | 1 each |
| 6. | Printer sharing Switch | 1 |
| 7. | Oscilloscope (15 MHz Single Trace) | 1 |
| 8. | Digital Multimeter. | 2 |
| 9. | Analogue multimeter (High Sensitivity) | 2 |
| 10. | Logic Probe | 2 |
| 11. | Software Packages and Diagnostic Software (Refer Practical List) | 1 each |
| 12. | Floppy box (containing 10 floppies), CDS | 1 |
| 13. | Electronic Technicians tool kit Screwdriver Pliers, Cutters, Soldering, Iron, Solder wire, Twisters etc.) | 1 set |
| 14. | Floppy head cleaning diskette | 1 |
| 15. | Switch cleaning / PCB cleaning solutions. | -- |
| 16. | Experiments as per practical list. | 1 each |
| 17. | Colour Monitor | 1 optional |
| 18. | UPS system / servo Stabilizer. | 1 optional |
| 19. | LAN Installation | 1 optional |
| 20. | External / Internal Modem | 1 |
| 21. | Un Assembled computer | 1 |

## PREFERENCE BOOKS :-

| | | |
|---|---|---|
| 1) | Transistor Circuit Approximations | Malvino |
| 2) | Op-Amp & Linear Integrated Circuits | R. Gayakwad |
| 3) | Digital principles & Application | Malvind & Leach |
| 4) | Digital computer Electronics | Malvind & Leach |
| 5) | 0000 To 8085 | Sreedhar & Ghosh |
| 6) | Microprocessor Architecture Programming And Application | Ramesh Goankar |
| 7) | Ibm PC and Clones (Second Edition) | Govindrajalu |
| 8) | Upgrading and Repairing PCs (Fourth Edition) | Sott Mueller |
| 9) | Complete PC Upgrade & Maintenance Guide (2003 Edition) | Mark Minasi |
| 10) | PC Hardware A Beginner's Guide | Ron Glister |
| 11) | Modern Computer Hardware Course | Manohar Lotia |
| 12) | Modern All About Key Board And Mouse | Manohar Lotia |
| 13) | Modern All About Printers | Manohar Lotia |
| 14) | All About Mother Board (Second Edition) | Manohar Lotia |
| 15) | Modern All About Hard Disk | Manohar Lotia |
| 16) | The Complete PC Upgrade & Maintenance Lab Manual | Richard Mansfield |
| 17) | Hardware Bible | Winn L. Rosch. |

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