PMAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION MUMBAI - 51

1	Name of Course	**Certificate Course in Mechanic DTH / Communication System**
2	Course Code	**301210**
3	Max. Nos. of Student	25 Students
4	Duration	1 Year
5	Type	Full Time
6	Nos. of Days / Week	6 Days
7	Nos. of Hours /Days	7 Hrs
8	Space Required	Theory Class Room – 200 sqft Practical – 500 sqft
9	Entry Qualification	S.S.C.
10	Objective of Syllabus/ Introduction	Student will be able to - use various tools and equipment used for Electrical and Electronics Maintenance, To understand Principal and design of operation of DTH and Communication Systems, Repair and Maintain DTH and Communication Systems
11	Employment Opportunity	Work as DTH Operator, DTH Mechanic, DTH Service Personnel in company offering DTH and Other communication Services in City,
12	Teacher's Qualification	B. E. Electronics & Communication Tech
13	Training System	**Training System Per Week**

Theory	Practical	Total
18 Hours	24 Hours	42 Hours

14 Exam. System

Sr.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Min. Marks
1	**30121011**	**Basic Information Technology**	TH-I	3 Hrs	100	35
2	**30121012**	**Electronics and Communication Systems**	TH-II	3 Hrs	100	35
3	**30121013**	**Workshop Calculation, Science and Drawing**	TH-III	3 Hrs	100	35
4	**30121021**	**Basic Information Technology**	PR-I	3 Hrs	100	50
5	**30121022**	**Electronics and Communication Systems**	PR-II	3 Hrs	100	50
6	**30121023**	**Workshop Calculation, Science and Drawing**	PR-III	3 Hrs	100	50
		Total			**600**	**255**

SYLLABUS

Theory & Practical - I

Basic Information Technology

Theory	Practical
Computer Fundamental **1] Fundamentals of Computer** Introduction Components of PC The system Unit Front part of system Unit Back part of system Unit CPU Memory of computer Monitor Mouse, Keyboard Disk, Printer, Scanner, Modem, Video, Sound cards, Speakers	1. Working with Windows 2000 desktop ,start icon, taskbar, Recycle Bin, My Computer icon ,The Recycle Bin and deleted files Creating shortcuts on the desktop 2. The Windows 2000 accessories, WordPad – editing an existing document, Use of Paint – drawing tools The Calculator, Clock 3. The Windows Explorer window, concept of drives, folders and files? Folder selection techniques, Switching drives, Folder creation, Moving or copying files, Renaming, Deleting files ,and folders 4. Printing, Installing a printer driver, Setting up a printer, Default and installed printers, Controlling print queues, Viewing installed fonts, The clipboard and 'drag and drop', Basic clipboard concepts Linking vs. embedding,
2] Introduction To Windows 2000/Xp Working with window Desktop Components of window Menu bar option Starting window Getting familiar with desktop Moving from one window to another Reverting windows to its previous size Opening task bar buttons into a windows Creating shortcut of program Quitting windows	5. Moving through a Word document menu bar and drop down menus toolbars 6. Entering text into a Word 2000 document, selection techniques Deleting text 7. Font formatting keyboard shortcuts 8. Paragraph formatting Bullets and numbering 9. Page formatting What is page formatting? Page margins Page size and orientation Page breaks, Headers and footers 10. Introducing tables and columns
3] GUI Based Editing, Spreadsheets, Tables & Presentation Application Using MS Office 2000 & Open Office.Org Menus Opening, menus, Toolbars, standard toolbars, formatting toolbars & closing Quitting Document , Editing & designing your document Spreadsheets. Working & Manipulating data with Excel. Changing the layout Working with simple graphs. Presentation Working With PowerPoint and Presentation	11. Printing within Word 2000 Print setup Printing options Print preview 12. Development of application using mail merge. Mail merging addresses for envelopes Printing an addressed envelope and letter 13. Creating and using macros in a document 14. Creating and opening workbooks Entering data 15. Navigating in the worksheet Selecting items within Excel 2000 Inserting and deleting cells, rows and column Moving between worksheets, saving worksheet, workbook

4] Introduction To Internet What is Internet Equipment Required for Internet connection Sending &receiving Emails Browsing the WWW Creating own Email Account Internet chatting	16. Formatting and customizing data 17. Formulas, functions and named ranges 18. Creating, manipulating & changing the chart type 19. Printing, Page setup, Margins Sheet printing options, Printing a worksheet 20. ***** Preparing presentations with Microsoft Power Point. Slides and presentations, Opening an existing presentation , Saving a presentation
5] Usage of Computer System in various Domains Computer application in Offices, books publication data analysis ,accounting , investment, inventory control, graphics, database management, Instrumentation, Airline and railway ticket reservation, robotics, artificial intelligence, military, banks, design and research work, real-time, point of sale terminals, financial transaction terminals.	21. Using the AutoContent wizard ,Starting the AutoContent wizard, Selecting a presentation type within the AutoContent wizard Presentation type Presentation titles, footers and slide number 22. Creating a simple text slide, Selecting a slide layout Manipulating slide information within normal and outline view, Formatting and proofing text, Pictures and backgrounds, drawing toolbar, AutoShapes, Using clipart, Selecting objects, Grouping and un-grouping objects, The format painter
	23. Creating and running a slide show, Navigating through a slide show, Slide show transitions, Slide show timings. Animation effects 24. Microsoft Internet Explorer 5 & the Internet Connecting to the Internet The Internet Explorer program window, The on-line web tutorial Using hyper links, Responding to an email link on a web page 25.Searching the Internet, Searching the web via Microsoft Internet Explorer, Searching the Internet using Web Crawler, Searching the Internet using Yahoo, Commonly used search engines

6] Information technology for benefits of community Impact of computer on society Social responsibilities Applications of IT Impact of IT Ethics and information technology Future with information technology	26. Favorites, security & customizing Explorer Organizing Favorite web sites Customizing options – general, security, contents, connection, programs, advanced 27. ***** Using the Address Book Adding a new contact Creating a mailing group, Addressing a message, Finding an e-mail address 28. Using electronic mail, Starting Outlook Express Using the Outlook Express window, Changing the window layout, Reading file attachment, Taking action on message-deleting, forwarding, replying 29. Email & newsgroups, Creating and sending emails Attached files, Receiving emails, Locating and subscribing to newsgroups, Posting a message to a newsgroup 30. Chatting on internet, Understating Microsoft chat environment, Chat toolbar

List of Books

Computer Fundamental

1] Vikas Gupta Comdex Computer Course Kit First Dreamtech
2] Henry Lucas Information Technology for management 7Th Tata Mc-Graw Hills
3] B.Ram Computer Fundamentals Architecture and Organisation Revised 3rd New Age International Publisher

List of Tools and Equipment

A] General Class room

Sr	Name of Item	No.
1	Steel lockers 8 compartments with individual lockers (1980 x 910 x 480 mm)	4
2	Chair with writing pad	25
3	Steel almari with self 6.5’ x 3’ (18 gauge)	2
4	Steel table 4’ x 3’	2
5	Teacher chair	2

B] For Computer Fundamental and CAD Practical

Sr	Name of Item	No.
1	Computer System P4 with accessories Complete with license OS. compatible for- to run AutoCAD 2010 and Windows 7 OS.	5+1
2	Plotter- HP Design Jet 500 latest model	1
3	Scanner	1
4	Computer table	5+2
5	Chair for computer	10+2
6	Laser Printer	1
7	M. S. Office Software	1

Theory & Practical - II
Electronics and Communication System

Basic Electronics

Theory	Practical
1. Semiconductors 1.1 Intrinsic and Extrinsic semiconductors 1.2 Electrons and holes in an intrinsic semiconductor 1.3 Donor and acceptor impurities 1.4 Diffusion 1.5 Effect of temperature on intrinsic and extrinsic semiconductors.	**1. Study of dual channel CRO** 1.1 To Study the Front panel control of CRO,operation /application. 1.2 To study voltage measurement of AC/DC on CRO. 1.3 To study phase angle measurement on CRO. 1.4 To study component testing on CRO.
2. Semiconductors diode characteristics 2.1 Open circuited p.n. junction as a diode 2.2 Current components in P.N. diode 2.3 V.I. characteristics and its temperature dependence 2.4 Diode resistance 2.5 Load line concept 2.6 Diffusion capacitance 2.7 Diode Switching time 2.8 Junction diode data sheet 2.9 Zener diode 2.10 Schottkey diode 2.11 V.I. characteristics 2.12 Zener diode voltage regulator 2.13 Zener and schottkey diode data sheet	2. **Diode (Ge, Si) characteristics and effect of temperature**. 2.1 Testing of (Ge, Si) using DM. 2.2 Diode (Ge, Si) forward/reverse characteristics 2.3 Diode clipping circuits, clamping circuits
3. ReCTIFIERS AND FILTERS 3.1 Half wave rectifier 3.2 Full wave rectifier, Bridge rectifier 3.3 Ripple factor 3.4 Ratio of rectification	3. Zener diode characteristics and effect of voltage 3.1 Study of H.W.R./ F.W.R. with /without filter 3.2 Study of zener voltage regulator

4. BJT 4.1 THE JUNCTION TRANSISTOR 4.2 Transistor current components 4.3 Transistor as an amplifier 4.4 Transistor configurations and characteristics 4.5 Graphical analysis of the C.E. configuration 4.6 Analysis of cut-off and saturation regions 4.7 Typical transistor junction voltages 4.8 Transistor switching times and ratings Transistor as a switch.	4. **Bjt Operating Point And Load Lines, Effect Of Temperature** 4.1 I/P and O/P characteristics of C.B. configuration 4.2 I/P and O/P characteristics of C.E. configuration 4.3 To study the frequency response of single stage C.E. Amplifier 4.4 To study the frequency response of single stage C.B. Amplifier
5. Frequency Response of Bjt Amplifiers 5.1 Single stage C.E. amplifier and its frequency response 5.2 Effect of coupling and emitter bypass capacitors on low frequency respons	5. **To study the frequency response of two single stage R.C. coupled** Amplifier 5.1 To study frequency response of C.E RC coupled Amplifier 5.2 To study the coupling, bandwidth & frequency response. 5.3 To study the different type of coupling, Direct & Transformer Coupling
6. Multistage Amplifiers 6.1 Classification of amplifiers. 6.2 Decibel of Power Amplifier 6.3 Types of coupled Amplifier. 6.4 Direct coupled Amplifier. 6.5 R.C. coupled and transformer coupled amplifiers and their frequency response 6.6 Effect of cascading on Bandwidth and gain	6. **Operational Amplier** 6.1 Introduction to the Operational Amplier , 6.2 construction and working of Operational Amplier , 6.3 Schematic diagram of 741,symbol, Inverting and Non Inverting, Voltage amplifier, Linear and Non linear application of 741, Comparator using 741 6.4 Summing amplier and other popular opamp
7. Measurement Techniques & Measuring Instruments 7.1 Definition of measurement and instrument 7.2 Accuracy error, Range, Types of errors in measurement and Remedial methods 7.3 Merits and demerits. 7.4 Measurement of A.f. and R.F.	7. **Logic Gate** 7.1 To study the Basic Logic gate & verifying its Truth table. 7.2 Study of NAND/NOR as universal gates, Full adder using basic Gates & using NAND gates only, 7.3 Design of combinational circuit
8 Digital Techniques, Basic Logic Gates, Universal Gates 8.1 Binary, Decimal, Octal, Hexadecimal, 8.2 concept and design using AND, OR, NOT, NAND, NOR Verifying & study the truth table. 8.3 Boolean Algebra	8. **Decoder, Multiplexer** 8.1 Study of Decoder IC's, 8.2 Study of Multiplexer IC's, study of 4 bit parall adder, study of 4-bit comparator.

9 Arthmetic Elements 9.1 Half adder, full adder, Half subtract or, Full subtract or 9.2 1's complement, 2's complement 9.3 BCD adder. 9.4 Design of circuits using universal gates 9.5 Decoders, Encoders, Multiplexers, Demultiplexers 9.6 Flip Flops - R-S, J-K, Master slave f.f, and D types, Counters, synchronous and asynchronous Basic concept and Design using excitation table of flip flops e.g. binary, BCD.	9. **Flip Flops** 9.1 Study of Flip-flops. 9.2 RS Flip flop, J-K Flip flop, D Flip flop. 9.3 Master slave Flip flop 10. **Counter Ic** 10.1 Study of counter IC's, & its practical application. 10.2 Study of synchronous counter, & its application 11. **Digital To Analog Converters** 11.1 Study of D to A conversion. 11.2 Study of A to D conversion 12 **Ic Fabrications, Pcb Designing** 12.1 Monolithic IC fabrication techniques 12.2Designing of Single ended Printed circuit Board. 12.3Designing of Double ended Printed circuit Board., glass poxy.

Communication Systems

Sr.No.	Practical	Theory
1	1. To understand working principles of Telephone Instruments and EPABX system with respect to industries 2. Fault finding telephone instrument and EPABX system. 3.To understand automatic exchanges.	**Telephone and EPABX System:** principles of manual and automatic exchanges.
2	1. To understand & fault finding of AM/FM/ transmitter & Receiver. with respect to industries 2. To understand various types of modulation such as PAM, PDM, PPM, PCM. 3. To understand FDM & TDM	**Modulation Theory and Circuit: -** Amplitude modulation, AM-DSB, AM-DSB/SC, AM-SSB and their comparison. Modulating and demodulating circuits for AM, FM, and phase modulation. Automatic frequency control. Pulse modulation: PAM, PDM, PPM, PCM, delta modulation and circuits. Principles of multiplexing FDM and TDM, frequency generation and synchronization circuits
3	1. To understand & fault finding in demodulator circuit used in PCM system. 2. To understand Fiber optics communication& its characteristic 3.To understand the joining techniques, laying techniques etc. 4. To understand of LASER & optical transmitter. with respect to industries	**Communication System: -** Signal to noise ratio in envelope detectors, signal to noise ratio in envelope detectors, signal to noise ratio PCM systems, comparison of modulation system. **Optical Communication: -** Need of optical communication; Laser & related devices as sources in optical transmitters, modulation techniques- Analog, Digital, Optoelectronics device for receiver- APD's PCN photodiodes, etc. Low- noise front ends for optical receiver; Free space and fiber- optic communication: Basic of fiber optic characteristics, measurement, joining techniques, laying techniques etc.
4	1. To understand Microwave Transmitter with respect to industries 2. To understand Microwave Receiver. with respect to industries	Microwave Links: - Terrestrial line- of - sight communication links, propagation, effects of atmosphere, interference, fading sites and route selection, terminal equipments, including
	3. To understand GCM Mobile & fault finding 4. To understand CDMA Mobile & fault finding. 5. To understand the Broadband / Triband system of communication. 6. To understand Blue tooth/ infrared communication 7. To understand Wmax system. with respect to industries	multiplexers, transmitters/receivers. Introduction to troposcatter communication & satellite communication. Mobile Networking :- GSM, CDMA, TDMA, FDMA, SDMA system Broadband system, Triband System Blue tooth & Infrared techniques in mobile fields. Introduction to Wmax System

5	1) To understand Direct to home (DTH) system, 2) To understand the working of equipment used in DTH. 3) Installation & troubleshooting of DTH system with respect to industries	Introduction to CAS & DTH system
6	1)To understand satellite communication system. with respect to industries 2) To understand the working of equipment used in earth station.	Satellite Communication: - Need of Satellite communication, Low-Orbiting and geo-synchronous satellite for communication, choice of frequency bands, current standards. Satellite location in Geo synchronous orbits, current standards, Digital modulation techniques, signal strength calculation, choice of antennas and on board systems, Earth stations antennas, terminal equipments, interfacing with ground network etc. INTELSAT, INSAT, MOLNIYA and other typical systems, satellite broadcasting- basic principles, Remote sensing - basic principles..
7	Project work	Soldering technique, Manuel, Wave soldering, SMD / SMT Technology. SMD Soldering Technique. PCB Design with Latest software/

Reference Books

1 Integrated electronics Millman And Halkias
2 Electronics devices and circuits Millman And Halkias
3 Microelectronics Jacop Millman
4 Electronics devices and circuits theory Robert Boylestad
5 Electronics devices and circuits theory Allen Mottershed
6 Basic electronics and linear circuits Bharagava
7 Electronic Measurement & Instrumentation B. Oliver & Cage
8 Electronic instrumentation and Measurement Techniques W.D.Cooper
9 Digital Principles & Application Milavino & Leach
10 Digital Integrated Electronics Taub & Schilling

Theory & Practical – III

Workshop Calculation, Science and Drawing

	Workshop Calculation, Science
1.	Simple arithmetic addition, subtraction , Multiplication, Division of whole and partial number. Properties of metals and their importance in trade
2.	Fraction & decimals , conversion of fraction to decimals and vice versa/
3.	Properties of C.I. & its types, uses. properties of Non –ferrous metals and how its identifications.
4.	Properties of copper, Zinc , mind steel , aluminum etc.
5.	Properties of Brass steel , bearing metals, timper etc.
6.	Decimals, Division, multiplication
7.	Logarithm and how to find out mantisa & characteristics.
8.	Properties of C.I steel
9.	Work , power , energy
10.	Motion, velocity and problems.
11.	Volume, mass, density applied problems.
12.	Properties of metal and their applications
13.	Square roots, power conversion of decimal to British & vice versa
14.	Square roots, power conversion of decimal to British and Vice versa
15.	Multiplication power root of a number
16.	Problems on work , power & energy
17.	Ratio & percentages and problems
18.	Meaning to stress, strain, energy , elasticity
19.	Meaning of stress, strain, energy , elasticity
20.	Stress and its important factors example.
21.	Ration and proportions, ratio, fining forms and ratio proportions direct and indirect proportions
22.	Application of ratio and proportion to shop problems
23.	Mixed direct and indirect proportion problems
24.	Machines – basic principles, velocity ratio. mechanical advantages, efficient simple problems.
25.	Algebraic symbols & fundamental algebraic operations signs & symbols used in algebra, co-efficient, terms like terms and unlike terms
26.	Addition and subtraction , multiplication and division
27.	Logarithm and antilogarithms . Problems on logarithms
28.	Simple machines like winch pulley & compound axel etc. with examples.
29.	Factors and equation of algebric formula.
30.	Factors and equations-types of factorisations.
31.	Heat treatment of steel-hardening, appealing, tempering, normalizing, case hardening-standard and measurements-equations-simple simultaneous quadratic.
32.	Application construction and solution of problem by equations.
33.	Atmospheric pressure. pressuregauge gauge pressure & absolute pressure.
34.	Power & exponent & laws of exponent.
35.	Arithmetical operations involving logarithms in the computations.
36.	Problems related to trade using logarithm tables.
37.	Density of solid and liquids simple experiments and determination.

38.	Specific gravity principle of Archemedies.
39.	Relation between specific gravity and density. Simple experimental determination.
40.	Geometry- Fund-mental geometrical definitions angles and properties of angles, triangles and properties of triangles.
41.	Pythagoras theorem, properties of similar triangles.
42.	Revision of !st year topics.
43.	Revision of 1st year topics.
44.	Rectangle, square, rhombus, parallelograms etc. and their pproperties.
45.	Circle and properties of circles. Regular polygon.
46.	application of geometry to shop problem
47.	Heat & temp. thermometric scales their conversions.
48.	Temp. measuring instruments.
49.	quantity of specific heat of solids liquids & gears.
50.	Heat loss and heat gain with simple problem
51.	Mensurations, plain figures-triangles, square rectangles, parallelogram.
52.	Plain figures-trapezium, regular polygons, circle, hollow circles.
53.	Plain figures segment and sector of circle, ellipse fillets.
54.	Solid figures- prism, cylinder, pyramid, cone.
55.	Solid figures-frustom of cones sphere, spherical segment.
56.	Material weight and cost problems related to trade.
57.	Trigonometry, Trigonometrical ratios use of trigono table.
58.	Finding height and distance trigonometrically
59.	Area of triangle by trigonometry.
60.	Application of trigonometry to shop problems.
61.	Application of trigonometry to shop problems.
62.	Triangle of forces. Parallelogram of forces.
63.	Composition and resolution of forces.
64.	Representation of forces by vectors. Simple problem on lifting tackles like jib cranes, wall crane and solution of problem with the aid of vectors.
65.	Simple problems on strength and crank lever.
66.	Center of gravity-simple experimental determination stable-unstable and neutral equilibrium simple explanation.
67.	Friction-co-efficient of friction.
68.	Simple problem related to friction.
69.	Magnetic substances neutral and artificial magnets.
70.	Bausch principle of electricity. Method of magnetization & uses of magnets,.
71.	Basic principle of electricity.
72.	Use of fuses, conductors switches, insulator etc.
73.	Simple electric circuits. Simple calculations.
74.	Ohm's law-simple calculations-electrical insulation materials.
75.	Graphs-Abscissa & ordinates, graphs of straight line, related to 2 sets of varying quantities.
76.	Further practice on logarithm.
77.	Shop problems on estimation of material, time taken for machining a job elementary time and motion study.
78.	Shop problems on estimation of material, time taken for machining a job, elementary time and energy.
79.	Transmission of power by belt pulley and gear drive.

	Engineering Drawing
1.	Reading of simple drawing , Engineering drawing & its importance and instruments used in drawing
2.	i) Making of Title blocks as per IS 465 1988 ii) Various sizes of drawing sheets iii) Various types of pencils & sharpening methods. iv) Types of lines & their application as Per SP 46: 1988
3.	use of drawing tools simple geometrical construction
4.	Geometrical construction regular polygone circles
5.	Geometrical construction of polygon inscribed circles
6.	Curves and types of curves & their application and method of drawing curves
7.	Geometrical construction, cycloid, hyperbola parabola curves, ellipse.
8.	Free hand sketch of lines, polygons , ellipse etc.
9.	Free hand sketch of basic tools and simple geometrical const. cone, pyramid , frustom / prism etc. / sphere
10.	Construction of scale diagram, division of odd parts of scale with drawing instruments by sketch
11.	Letters and its types and drawing of letters
12.	Methods of ellipse. How to draw by drawing the instruments .
13.	Simple dimensions with technics and location of parts as per dimensions , angle , taper
14.	Transforming of various measurement, linear , Angular , Circular etc.
15.	Pictorial drawing Isometric drawings of simple block
16.	Oblique views of simple geometrical construction
17.	Isometric drawing on simple blocks
18.	Isometric drawing on completed jobs
19.	Free hand sketches of trade related hand tools cutting tools, measuring tools
20.	Free hand sketches of trades related hand tools m measuring tools
21.	orthographic drawing application of both first angle and third angle methods in representing the drawing for simple & complex machine blocks given for exercise with dimensions
22.	Orthographic drawings application of both first angle and third angle. Methods in representing the drawing for simple and complex machine blocks given for exercises with dimensions
23.	Standard method of sectioning as per IS-696. Exorcises for different sectional views on the given orthographic drawing of machine parts, castings etc.
24.	Standard method of sectioning as per IS 696. Exercise for different sectional views on the given orthographic drawing of machine parts, casting etc.
25.	Inter conversion of Isometric to orthographic drawings and vice-versa. Related problems such as V blocks-simple stepped blocks, block oriented by various machining operations etc.
26.	Interconversion of isometric, oblique drawings to orthographic drawings and vice-versa. Related problems such as V-blocks simple stepped blocks, block oriented by various machining operations etc.

27.	Free hand sketch of sectional tools.
28.	Interconversion of isometric, oblique drawing to orthographic drawings and vice-versa. Related problems such as V block simple stepped blocks, blocks oriented by various machining operations.
29.	Surface development of simple geometrical solids like cube, rectangular block, cone, pyramid, cylinder, prism etc.
30.	Interpenetrating of solids and conventional application of intersectional curves on drawings.
31.	Screw thread their standard forms as per I.S. external and internal thread conventions on the feature for drawings as per I.S.I.
32.	Sketches for bolts nuts screw and other screw screwed members
33.	Standard rivet forms as per ISI
34.	Riveted joints.
35.	Riveted joints butt
36.	Sketches of keys, cutter & pin joint.
37.	Sketches of keys, cotter and pin joints.
38.	Sketches for simple pipe unions with simple pipe line drawings.
39.	Concept of preparation of assembly drawing and detailing simple assembly and their details of trade related tools/jobs/exercises with dimensions from the given sample or model. Tool post for the lathe with screw and washer.
40.	Concept of preparation of assembly drawing and dove tailing. Simple assemblies and their details of trade related tools /jobs the exercises with dimensions from the given sample or models. Tool post for the lathe with washer and screw.
41.	Details and assembly of Vee block with clamps.
42.	Detail assembly of shaft and pulleys
43.	Details and assembly of vee blocks with clamps.
44.	Details and assembly of bush bearing.
45.	Types of curves. How to draw.
46.	Details and assembly of simple coupling.
47.	Details and assembly of a simple hand vice.
48.	Blue print reading simple exercises related to missing lines.
49.	Blue print reading simple exercises related to missing views.
50.	Simple exercises related to missing symbols.
51.	Simple exercises related to missing sections.
52.	Simple exercises to missing dimensions.
53.	Hand drawing for in-dictating switches, buttons control m/c. tool axis's quadrant point value.

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