



SYLLABUS

BIFOCAL VOCATIONAL ELECTRONICS, STD. XII

CHAPTER 1, PAPER 1, INSTRUMENTS

Quick View

Detailed study of CRT and CRO, how a CRO displays waveform, block diagram of CRO, front panel controls; applications of CRO
Function generator with relevant details,
Digital multimeter, how the DMM circuit works, with relevant details

Scope & Limitations



Cathode ray tube: Labeled diagram of CRT, function (in brief) of each electrode, electrostatic focusing, electrostatic and magnetic deflection—principle, features and simple applications of each type, screen of CRT—phosphorescence, fluorescence, function of aquadag coating.

Block diagram of CRO: vertical amplifier, delay line, trigger-circuit, time base generator, horizontal amplifier, HV/LV power supply and CRT, function of each block, basic circuit for time base generator only, how CRO displays waveforms.

Front panel controls of single beam dual trace CRO.

Applications: phase, frequency, time, amplitude measurement using Lissajou's figures and directly (internal time base), (no reference to dual beam CRO, DSO or facilities like component testing, TV testing), (no mathematical treatment/analysis expected)

Function generator: basic elements of function generator, block diagram and brief description of each block. Working circuit of function generator, simple applications of function generator

Digital multimeter: block diagram of DMM and brief description of each block.

Resistance, AC/DC voltage, AC/DC current measurement: How to use DMM? Step wise description of application of DMM.

Complete study material

11th & 12th std. bifocal electronics is available

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CHAPTER 2, PAPER 1, DC POWER SUPPLIES

Quick View

Half wave rectifier, full wave rectifier, bridge rectifier, filter circuits, load regulation, line regulation, zener diode as voltage regulator, basic principle of voltage regulation using transistor circuit; 3-terminal voltage regulator ICs, basic principle of SMPS and its advantages

Scope & Limitations

Rectifier circuits: rectification, average voltage, current rating PIV differences between FWR using centertap transformer and BR rectifier (merits & demerits). Mathematical analysis not required, problems on above topics are expected.

Filters: capacitor, inductor, RC and LC (no mathematical analysis), percentage ripple; single L-type filter and combination of two L-type filter.

Concept of regulation: regulators, concept and requirement for regulation, load regulation and line regulation—definitions.

Zener regulator: zener regulator—I.V. graph of zener diode, ratings, voltage regulation; (simple problems expected).

Transistorized regulator: (for series pass element) regulator circuit diagram, expression for output voltage, power dissipation in series pass element, current limiting—basic idea only (no fold-back limiting), power supply characteristics—load regulation, line regulation, over voltage/over load protection (concepts only), output impedance, ripple rejection (no numerical).

3-terminal voltage regulator: functional block diagram and its brief explanation, types—fixed and variable and their applications (no numerical); LM 317 voltage regulator.

Switch mode power supply: basic idea & advantages.



CHAPTER 3, PAPER 1, TRANSDUCERS AND SENSORS

Quick View

Classification, selection, types and working of following transducers: Temperature transducer, pressure transducer, light transducer, displacement transducer.

Scope & Limitations

Classifications: active/passive and definitions, example of each type.

Selection: selection of transducers on the basis of the quantity to be measured and characteristics required.

Types of transducers: temperature, pressure, light, displacement (sound).

Working of transducers: thermister, LDR, capacitive transducer, linear variable differential transformer, piezo-electric crystal, loud speaker, gas sensor and opto coupler.

Applications, advantages & disadvantages: basic idea of each.

CHAPTER 4, PAPER 1, OPERATIONAL AMPLIFIERS

Quick View

RC and DC amplifiers, differential amplifier, dual power supply, block diagram of opamp.

Linear applications of operational amplifier (using single opamp with derivation) concept of virtual ground.

Non linear applications of operational amplifier (basic circuits)

Scope & Limitations



Introduction: drawbacks of RC coupled and direct coupled amplifier, advantages of differential amplifier, need for dual power supply, internal block diagram of opamp and brief description of each block, schematic symbol of operational amplifier.

Parameters: opamp parameters, input offset voltage, input bias current, input offset current, CMRR, frequency response, slew rate.

Linear applications: non-inverting configuration and inverting configuration basic diagram and simple derivation. Concept of virtual ground, buffer, adder, subtractor, integrator and differentiator (using single opamp, derivation in each case is expected, numerical expected)

Non-linear applications: comparator, Schmitt trigger, their applications (basic circuits only), (in all above cases practical applications should be stated).

CHAPTER 5, PAPER 1, MODERN ELECTRONICS COMMUNICATION

Scope & Limitations

Elements of communication system: transmitter, communication channel, receiver. Function of each block with examples like telephone and radio.

Types of electronic communication: classification as simplex, duplex, analog, digital, baseband and modulated communication. Meaning of above terms with suitable example only.

Electromagnetic spectrum: idea of electromagnetic spectrum used in electronic communication and various frequency ranges used for communication (students are NOT expected to remember figures of electro-magnetic spectrum for exam).

Bandwidth: idea of bandwidth, its determination and importance in limiting the number of communication channels.

Modulation: necessity, types AM & FM only.

AM: basic waveforms, expression for output. Amplitude expression. No block diagram/circuits expected). Modulation index and percentage of modulation (with necessary figures). Idea of sidebands, why they are produced, calculation of fUSB & fLSB and hence, bandwidth required.

FM: basic principle, waveforms, idea of sidebands and modulation index. Merits/Demerits of FM over AM and vice versa.

Satellite communication: what is a satellite? Meaning of geosynchronous satellite, use of satellite as relay station, typical frequency used.

Satellite communication system: transponder, basic block diagram of transponder, various frequency bands used in satellite communication (student need NOT remember frequency bands for examination)

Applications overview of satellite: communication (TV and telephony), Surveillance (military), Observation (meteorology, monitoring earth's resources etc.) GPS system (introduction only).

Concepts of digital communication: data communication by binary digits, ASCII, serial and parallel communication (concepts only, where each is used?), speed of data transfer (baud rate).

Modem, introduction to computer networks: what is modem? Its used in communication. Why network (for sharing SW/HW in LAN node, server, meaning of LAN, MAN and WAN. Network topologies – star, ring and bus. Advantages of each.

Fiber optic communication: basic block diagram of fiber optic communication system showing – input data to coder, light source (transmitter), fiber optic cable, light detector, amplifier, wave shaper, decoder and output data. Function of each block in brief. Advantages of fiber optic cables over conventional electrical cables. Amplitude of fiber optic cables (mention only).

Facsimile (Fax): what is fax? Basic block diagram – source of light, CCD, ADC, digital data compressor, modulator to telephone line interface, telephone line interface to demodulator, data expands, printer, control logic, motor control, operator control, working in brief. Concepts of scanning.

Cellular radio (cell phone): basic concepts of dividing geographical area into cells. Each having a low power transmitter, each cell connected to MTSO and automatic switching of system from one cell to another by MTSO. General block diagram of cellular radio – antenna, transmitter, receiver, frequency synthesizer, logic unit control unit, hand set etc. Function of each block in brief.

RADAR: basic concept, determination of distance, types of radars - pulsed and continuous wave radar- principle of working of each type, general block diagram of pulsed radar and function of each block in brief.

CHAPTER 6, PAPER 1, INTEGRATED CIRCUITS

Quick View

IC 555: block diagram, pin functions, simple applications – like AMV, MMV, PPM, PAM and FSK (numerical on AMV and MMV expected)

IC 741: block diagram, pin functions, simple applications

IC 317: block diagram, pin functions, simple applications



Scope & Limitations

IC 555: internal block diagram of the IC, importance of $5k\Omega$ resistors, discharge transistor, and the working of pin-4 in the IC.

Applications:

Concept of on delay and off delay timer circuits.

Pin configuration of IC 555 with the function of each pin connection.

Astable multivibrator using simple combination of R_1 and R_2 with timing capacitor C. The concept of duty cycle using time length and ratio of R_1 and R_2 . Idea of making duty cycle equal to 50%.

Monostable multivibrator using single resistor R_1 and timing capacitor C , basic equation of time period.
Pulse position modulation using IC 555, its diagram and working.
Concept of pulse amplitude modulation using IC 555, its block diagram and simple working.
Basic idea of frequency shift keying using IC 555. Its basic concept and the description of standard frequency values of logic-1 and logic-0 levels. Idea of calculating these values using the equations.

CHAPTER 1, PAPER 2, NUMBER SYSTEMS

Quick View

Basic number systems like Binary, hexadecimal and decimal, their basic conversions with respect to each other, binary arithmetic, addition, subtraction, simple idea and basic concepts only.

Scope & Limitations

Decimal, binary & hexadecimal: positional weights, base or radix of a number system, inter conversions (including fractions),
Like binary to decimal conversion, decimal to binary conversion, fractional binary to fractional decimal conversion, fractional decimal to fractional binary conversion.
Hexadecimal to decimal and decimal to hexadecimal conversion, fractional hexadecimal to fractional binary conversion, fractional binary to fractional hexadecimal conversion, etc. simple problems expected.

Codes: BCD code, ASCII (7-bit) code, EBCDIC (8-bit) code; problems/conversions NOT expected.

Binary Arithmetic: simple addition and subtraction using basic rules of binary arithmetic.
Binary addition and subtraction using 1's complement and 2's complement methods, both larger to smaller and vice versa, problems expected.



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CHAPTER 2, PAPER 2, LOGIC GATES

Quick View

Basic and derived gates, applications of derived gates, concept of exclusive OR gate, Boolean algebra and basic proofs, properties of derived gate as universal building blocks.

Parity and parity checker, applications of exclusive OR gate, half adder and full adder, concept of binary addition and subtraction.

Scope & Limitations



Introduction: basic logic operations: AND, OR & NOT gates (circuits of lamp/switches, diodes, transistors NOT expected).

Basic gates: AND, OR, NOT gates – symbols, truth tables, Boolean algebra and its distributive, associative and commutative laws.

De Morgan's theorems: statements, proofs and logic diagrams representation, implementation of Boolean equations using logic gates. Simplification of Boolean equation using Boolean laws (no K-maps expected), (problems expected).

Derived gates: NAND gate & NOR gate; symbols, truth tables. NAND gate and NOR gate as universal building blocks.

Ex-OR gate: symbols, truth table, Ex-OR gate using logic gates and truth table, the 4-bit binary adder/subtractor.

CHAPTER 3, PAPER 2, LOGIC FAMILIES

Quick View

Introduction to logic families with basic idea about unipolar and bipolar logic circuits.

Basic idea of TTL and CMOS with elementary explanation on MOSFETs circuits. Basic comparison of the two types.

Scope & Limitations

Logic families: unipolar and bipolar families (names only)

TTL: basic circuits of NAND gate, NOR gate, NOT gate and their working.

CMOS: basic circuits of NOT gate, NAND gate and NOR gate and their working.

Open collector TTL: circuit and working of NAND gate only.

Tristate: concept with circuit and working (specific IC numbers should be cited but NOT expected in examination)

Characteristics: current and voltage parameters, noise margin, fan-out, power dissipation, propagation delay, figure of merit & operating temperature (definitions only)

CHAPTER 4, PAPER 2, COMBINATIONAL LOGIC CIRCUITS

Quick View

Details of multiplexer, demultiplexer, encoder and decoder. Block diagram of mux, demux, their ICs used in applications, advantages and disadvantages, applications

Scope & Limitations



Multiplexer: block diagram of 4:1 line mux, mechanical circuit of mux using rotary switch, basic circuit of mux with 4:1 line mux using bubbled AND gates and select inputs combinations, multiplexer ICs used in commercial and military applications, advantages and disadvantages, general applications of mux.

Demultiplexer: block diagram of 1:4 line demux, mechanical circuit of demux using rotary switch, basic circuit of demux with 1:4 line demux using bubbled AND gates and select inputs combinations, demultiplexer ICs used in commercial and military applications, advantages and disadvantages, general applications of demux.

Encoder: basic concept of encoder, circuit of encoder using OR gates, truth table and simple conversions.

Decoder: basic circuit of decoder using gates with 10 decimal outputs, concept of 7-segment LED display, common anode and common cathode type 7-segment LED displays, their combinations, functional circuit of IC 7447/7448 with LED display, truth table.

CHAPTER 5, PAPER 2, FLIP-FLOPS

Quick View

Concept of memory, 1-bit memory cell using flip-flop, idea of clock, different types of basic flip-flops, their working, truth table, logic diagram and simple explanation

An intro to registers, idea of shifting data, right and left shifting of data. Basic types of counters, modulus of counter, etc.

Scope & Limitations

Flip-flops: RS flip-flop, logic diagram using NAND gate/NOR gate with working and truth table. Concept of one-bit memory cell. Concept of clock, clocked RS flip-flop, clocked D-flip-flop, JK flip-flop, edge triggering (+ve and -ve edge), T-flip-flop, JK MS flip-flop

Registers: introduction to registers, four types of data transfer: SISO – PIPO, detailed circuit and working of left shift and right shift registers using D type flip-flops

Counters: idea of counter, modulus of counter, natural count, ripple counter, decade counter (asynchronous and synchronous counters) logic diagram, explanation, waveform and truth table of each is expected. Simple problems on basic counters.

Advanced counters: basic concept of up-down counter and ring counter.

CHAPTER 6, PAPER 2, A-D & D-A CONVERTERS

Quick View

Concept of analog and digital signals, basic idea of analog to digital converters, simple circuits only.
Need for conversion.
Basic concept of digital to analog conversion, simple circuits at block diagram level only.

Scope & Limitations

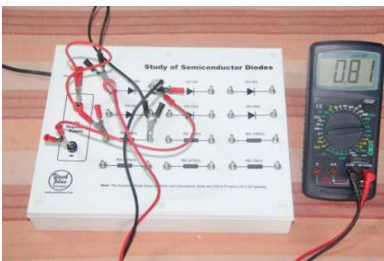


A/D & D/A conversion: need of A/D and D/A conversion. Primary weighted system, principle circuits, non-derived formula, simple calculations and problems, working and drawbacks.
DAC type 2R ladder: its principle, circuit and working, non-derived formula, simple calculations and problems, basic working.
A/D converter: simultaneous ADC, counter type ADC, successive approximation type ADC with block diagram and working. Simple numerical on DAC only are expected (maximum up to 4-bits only).

CHAPTER 7, PAPER 2, COMPUTER FUNDAMENTALS

Scope & Limitations

Computer: basic block diagram of computer (input-output, ALU, control unit, main memory, auxiliary memory with address, control and data lines (buses). Function of each block.
Input-output devices: input devices – keyboard, mouse, light pen, MICR, optical scanner. Output devices – dot matrix printer, ink jet printer, x-y plotter, COM (computer output microfilm) – only state the name and their uses; construction, working and specifications are NOT expected in examination.
Memory: main memory-RAM (static & dynamic), ROM, PROM, EPROM, EEPROM-only explanation of use (utility) without diagram, construction and working.
Secondary memory: floppy disk, hard disk, compact disc (CD ROM), magnetic tape, general explanation with read/write mechanism.
Specifications of a PC: clock frequency, main memory (RAM), secondary storage device (HDD), input-output ports, keyboard, monitor, processor, printer, mouse, floppy disk devices, CD drive, Modem, multimedia kit with sound blaster. Cache memory, requirements of UPS (specifications of any type are to be listed and explanation is NOT required).



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