



Shri Sangameshwar Education Society, Solapur

Kannada Linguistic Minority Institute

Sangameshwar College, Solapur

(Autonomous)

The Written Test – the First Phase of the Selection Process
for the Post(s) of Assistant Professor

Syllabus

Subject: Electronics

Unit1: Semiconductor devices, circuit theory, network analysis:

Semiconductor Devices -Basics: Intrinsic and extrinsic semiconductors, Formation of p-n junction, Barrier potential, I-V characteristics, Zener diode, Breakdown mechanism (Zener & avalanche), LED, Photo diode, Solar cell, Varactor diode, Schottky diode, PNP diode, (Construction, working, I-V characteristics, comparative studies of diodes and applications)

Basic Concepts of Electronics, Circuit components, Principles of Circuit Analysis, Circuit Theorems-Superposition, Thevenin, Norton and Maximum Power Transfer Theorems, Network elements, Network graphs, Nodal and Mesh analysis. Laplace Transform, Fourier Transform and Z-transform. Time and frequency domain response, Passive filters, Two-port Network Parameters: Z, Y, ABCD and h parameters, Transfer functions, Signal representation, State variable method of circuit analysis, AC circuit analysis, Transient analysis, Zero and Poles, Bode Plots, Basic concepts of digital signal processing, digital filters – IIR, FIR. Applications of Semiconductor Devices. Rectifiers: HWR, FWR (center tapped and bridge), Filters: types, shunt, LC, CLC (π) filter (Qualitative analysis), Regulators: Zener diode as a regulator, circuit diagram and explanation for load and line regulation.

Unit2: Digital and analog electronics, introduction to ICs and applications:

Digital electronics:

Number Systems: Binary, Octal, Decimal, Hexadecimal Number Systems and their interconversions, Binary Arithmetic (Addition, Subtraction, Multiplication and Division), Binary subtraction using 1's and 2's complement method). Logic gates and Boolean algebra, arithmetic operations using logic gates, combinational (Half-full adders, multiplexer-demultiplexers, encoder, decoder and sequential circuits (flip-flops, counters)

Analog electronics: Basics of Electronic Circuit-Important definitions: EMF, Current, Electric Potential, Resistance, Conductance, Concept and parameters of AC and DC,

AC and DC sources. Transistors - BJT, FET, MOSFET, UJT, SCR, DIAC, TRIAC - biasing, comparative study, applications, characteristics, specifications, qualitative and quantitative analysis

Concept of feedback in amplifiers, sinusoidal oscillators

ICs and applications- analog ICs, digital ICs, IC-741, Timer IC-555 & its applications.

Unit3: Sensors, transducers, Pulse & switching circuits:

Fundamentals of Sensors and Transducers - Basic needs of measurements, Block diagram of measurement system, Characteristics of measurement Systems, static characteristics, dynamic characteristics and responses, Need of system calibration.

Definition: Sensor and Transducer, Principle of transduction, Basic difference between sensor and transducer, Types of sensors, Static and Dynamic characteristics, Classification of transducers, Basic requirement of transducers, Selection criteria for transducer, Concept of Active and Passive Sensors

Resistive transducers, capacitive & inductive transducers, electronic transducers & actuators.

Unit4: Operational amplifiers (Linear and non-linear) & applications:

Operational amplifiers (OPAMP) - characteristics, computational applications, comparators, Schmitt trigger, Instrumentation amplifiers, wave shaping circuits, Phase locked loops, Active filters, Multivibrators, Voltage to frequency convertors (V/F), frequency to voltage convertors (F/V). Types of filters, op-amp regulated power supply design using ICs, protection circuits for IC regulators, Instrumentation amplifiers and PLL. Programmable Instrumentation amplifiers: Salient features, Block diagram and Pin description of Instrumentation amplifier AD620 VCO, Block diagram of PLL, Principle and working of PLL, Transfer characteristics.

Unit5: Microprocessor and microcontrollers, Biomedical & Electronics instruments:

8085, 8086, 8051 - Introduction, Basic system bus architecture, microprocessors and their features, Concept of T state, Machine cycle, Instruction cycle, Types of microprocessor (According to bus and application), instruction set, interfacing, applications Interfacing with 8085-Concept of interfacing, Types of interfacing, Concept of I/O mapping & I/O memory mapping techniques, Study only Pin diagram, Block diagram and Control word register of PPI [8255], Interfacing of 8255 to 8085, Block diagram and Control word register of Programmable timer [8253] Applications of 8085 microprocessor-Interfacing of LED, Switch, LCD, DC motor and stepper motor Electronics instruments-voltmeters, ammeters, galvanometer, DMM, CRO, DSO, FG, Regulated power supply, Biomedical instruments/Electronics Monitoring Systems -Electrocardiograph (ECG): Basic principle, block diagram of ECG. Electroencephalograph (EEG): Basic principle, block diagram of EEG. Electromyograph (EMG): Basic principle, block diagram of EMG.

Unit6: Embedded System Design with 8051 & PIC Microcontroller, Interfacing & ARM processor, Optoelectronics:

Fundamentals of embedded system design & Embedded-C programming, Fundamentals of embedded system, Basic Structure of Embedded C program, Need of Operating System, Concept of Super loop. Steps involved in Programming with Kiel Micro Vision 4, Embedded C programming for arithmetic and logical operations, data conversion programs, time delay generation and I/O port programming, Programming of the Timer: Time delay program using timer, square wave generation, frequency measurement using counter. Programming Serial Port: Serial data transfer from Microcontroller to PC and vice versa, I/o interfacing of 8051 microcontroller, PIC Microcontroller: Features and Architecture, classifications, interfacing, PICx programming in C, PICx interfacing Introduction to ARM processor: RISC and CISC architecture, ARM processor family, Architecture of ARM processor, AMBA bus architecture, ARM Instruction set, ARM7TDMI, Dataflow model, registers, modes of operation. Optoelectronics-Elemental and optical properties of semiconductors, Optoelectronic devices & their applications in medical diagnosis, introduction to Optical fiber.

Unit7: Analog and Digital Communication Systems, Antenna and Radio Wave Propagation:

Introduction to Communication System -Introduction, Need, importance, Elements of electronic communication system, Types of communication system, analog communication system, digital communication system, concept of simplex and duplex communication, Noise in communication (S/N ratio and noise figure), Need of modulation, Types of modulations, digital demodulation. Antenna and Radio Wave Propagation - Principle of antenna, Concept of radiation pattern, Antenna parameters, Evaluation of ($\lambda/2$) antenna (without mathematical treatment). Types of antennae: Yagi and Parabolic antennas (radiation pattern, frequency range, applications). Radio Wave propagation: Principle, types of radio wave propagation: Ground waves, Space waves, Sky waves, Concept of skip distance and Virtual height, Radio receiver: Characteristics of receiver, Super heterodyne principle.

Unit8: CAD Tools for PCB/Circuit Design, Simulation, Introduction to Computer Network:

Programming languages & circuit problem solving softwares: C, C++, JAVA, Circuit Problem Solving Using JAVA, Python, Single Board Computer with Python and IoT, Basics of Proteus, LabVIEW & MATLAB, Data science and machine learning, basics of internet of things (IoT) & artificial intelligence (AI).

Introduction to computer network-Introduction to computer network, applications, Transmission modes: Simplex and Duplex, OSI model, Layers in OSI model Components of Network-NIC, Hub, Switches, Router, Cables and Connector, Modem, Connection types

Types of Network and Topologies-Types of networks: PAN, LAN, MAN, WAN, Topologies: star, ring, bus, mesh, tree

Internet-Internet Service Providers (ISP), internet addressing system: IP address with their classification and notation, application layer protocols: (DNS, URL, WWW, FTP, SMTP, HTTP, TELNET), web pages, introduction to HTML.

Unit9: Teaching Methodology and NAAC