

General English (Full Marks : 100)

- (a) Essay Writing (*Not more than 300 words*)..... 20 Marks
- (b) Idioms & Phrases (*Objective Type/MCQ*) 16 Marks
- (c) Comprehension of given passages 12 Marks
(*Objective Type/MCQ*)
- (d) Grammar: (*Objective Type/MCQ*)
Parts of Speech : Nouns, Adjective, Verb, Adverb, Preposition, etc. 20 Marks
- (e) Composition (*Objective Type/MCQ*) 16 Marks
(i) *Analysis of complex and compound sentences.*
(ii) *Transformation of sentences.*
(iii) *Synthesis of sentences.*
- (f) Correct usage and vocabularies (*Objective Type/MCQ*) 16 Marks

ELECTRONICS ENGG. (Objective Type/MCQ) Paper-I (Full Marks : 150)**1. ELECTRONIC DEVICES AND CIRCUITS - 40 Marks****Unit-I Semiconductor and Diodes:**

Semiconductor – Classification - Intrinsic and Extrinsic - N type & P type - Drift current & Diffusion current – Diodes - PN junction diode - Forward and Reverse bias characteristics – Specification - Zener diode - Construction & working principle – Characteristics - Zener break down - Avalanche break down - Zener diode as a voltage regulator – Applications - Specifications.

Rectifier – Classification of Rectifiers - Half wave rectifier - Fullwave rectifier (Center tapped, Bridge) – Efficiency – Ripple factor – Applications – Filters – C, LC, and PI Filters.

Unit-II Bipolar Junction Transistor:

Transistor – NPN and PNP transistor – operation -- Transistor as an amplifier – Transistor biasing – Fixed bias, Collector base bias, Self bias – CB, CE, CC Configurations – Characteristics – Comparison between three configurations in terms of input impedance, output impedance, Current gain, Voltage gain – RC coupled amplifier – Load characteristic analysis – Emitter follower and its application – Negative feedback – Basic concept, effect of negative feedback, Types of Negative feedback connections – Transistor as a switch.

Unit-III Transistor Oscillators and FET and UJT:

Transistor oscillator – Classifications – Condition for oscillations (Barkhausen criterion) – Hartley Oscillator – Colpitts Oscillator – RC Phase shift oscillator, Crystal oscillator.

Field Effect Transistor – Construction – Working principle of FET – Difference between FET and BJT – Characteristics of FET – Applications – FET amplifier (Common source amplifier).

Uni Junction Transistor – Construction – Equivalent circuit – Operation – Characteristics – UJT as a relaxation oscillator.

Unit-IV : SCR, TRIAC, DIAC, MOSFET:

SCR – Working principle – Characteristics – SCR as a switch, Controlled rectifier – Specifications.

TRIAC – Working principle – Characteristics – Speed control of fan using DIAC and TRIAC.

DIAC – Working principle – Characteristics – DIAC as bi-directional switch.

MOSFET – Working principle – characteristics – MOSFET as a switch.

Unit-V Opto Electronics Devices and waveshaping circuits:

LDR, LED, Segment LED, LCD, Opto coupler, Opto interrupter – Infrared transmitter and receiver – Laser diode (Simple treatment) – Solar cell – Avalanche Photo diode – Photo transistor. Clipper, Clamper – Voltage doubler, Astablemultivibrator, Monostable and Bistable Multivibrators using Transistor.

2. DIGITAL ELECTRONICS**- 34 Marks****Unit-I: Number System and Boolean Algebra:-**

LOGIC GATES AND DIGITAL LOGIC FAMILIES : GATES - AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR. Implementation of logic function using gates, Realization of gates using universal gates - Simplification of expression using Boolean techniques, Boolean expression for outputs - Digital logic families-TTL, CMOS, Logics and their characteristics - comparison and applications, Tristate logic.

Unit-II: Combinational Circuits:

Arithmetic circuits - Binary-Addition, subtraction, 1's and 2's complement - Signed binary numbers - Half Adder and Full Adder - half Subtractor and Full Subtractor - Encoder, Decoder, Multiplexer, Demultiplexer - BCD adder, parity checker and generator.

Unit-III: Sequential Circuits

FLIP-FLOPS - SR, JK, T, D Flip-flops, Triggering of FF - edge & level – Counters -Asynchronous/ ripple counter, Decade counter, Up-Down counter (4 bit Synchronous counter). REGISTERS - 4-bit shift register - Serial IN Serial OUT, Serial IN parallel OUT, Parallel IN Serial OUT, Parallel IN Parallel OUT.

Unit-IV : Memory Devices

Classification of memories, RAM organization – Address Lines and Memory Size - Read/write operations - Static RAM - Dynamic RAM - SAD RAM - DDR RAM - ROM - Expanding memory - PROM - EPROM – EEPROM - Flash memory.

Unit-V: Microprocessor-8085

Evolution of microprocessor – 8085: Architecture, Instruction sets, Addressing modes, memory mapped I/O and I/O mapped I/O and its Comparison, Machine cycle-Opcode fetch, memory read, memory write, I/O read, I/O write.

3. LINEAR INTEGRATED CIRCUITS**- 36 Marks****Unit-I: Introduction to Operational Amplifiers**

Integrated circuit – Classification of IC-Advantages of IC over discrete components-Operational amplifier IC 741 - Schematic symbol for opamp - pin diagram of IC 741-Block diagram of an opamp-Characteristics of an Ideal opamp-Basic linear circuits-Inverting Amplifier, Non Inverting amplifier-Differential Amplifier.

Unit-II: Opamp Applications

Summing amplifier-Multiplier-Divider-Voltage follower-comparator-Integrator-Differentiator-Instrumentation amplifier - Waveform generators-square wave, triangular wave, sine wave, saw tooth wave generators. (Qualitative treatment only)

Unit-III: PLL & Applications

PLL-Basic principles and application of PLL - Basic components of PLL

Unit-IV: D/A and A/D Converters

Digital to analog converter – Basics of D/A conversion-R-2R Ladder D/A Converter

Analog to digital converter-Basics of A/D Conversion-sampling-Sample and hold circuit-quantization-Types of A/D converter.

Unit-V: Special Function ICs (qualitative treatment only)

IC 555 Timer Applications-Astable multivibrator-monostable multivibrator-Schmitt trigger.

4. MICROCONTROLLER - 20 Marks**Unit-I:Architecture & Instruction set of 8051:**

Comparison of Microprocessor and Microcontroller – Block diagram of Microcontroller – Functions of each block. Pin details of 8051 – ALU – ROM – RAM – Memory Organization of 8051-Special function registers-Program Counter-PSW register-Stack-I/O Ports-Timer-Interrupt-Serial Port-Oscillator and Clock-Clock Cycle-State-Machine Cycle-Instruction cycle-Reset-Power on Reset-Overview 8051 family.

Instruction set of 8051-Classification of 8051 Instructions-Data transfer instructions-Arithmetic Instructions-Logical instructions.

Unit-II: Programming Examples:

Structure of Assembly Language - Different addressing modes of 8051.

Unit-III: I/P and Timer:

Bit addresses for I/O and RAM-I/O programming-Programming 8051 Timers-Different modes of Timer.

5. ELECTRONIC SYSTEM DESIGN - 20 Marks**UNIT-I:**

Design of Power Supply : DC power supply with filters, regulators & protection circuits, Multi output and variable power supply design.

UNIT-II:

Design of small signal amplifiers : Emitter follower, two stage direct coupled amplifiers.

UNIT-III:

Data acquisition system: ADC, DAC, Design of Instrumentation amplifier. Design of Electronic voltmeter and ammeter.

UNIT-IV

Design of function generator : Design of AM signal using multiplier IC, AM signal demodulation using envelope detector, Design of FM signal using VCO (using IC NE566).

UNIT-V:

High voltage/high current driver : Circuit for Relay and motor control applications. Microcontroller based closed loop system, security systems, Microcontroller based stepper motor control system.

ELECTRONICS ENGG. (Objective Type/MCQ) Paper-II (Full Marks : 150)**1. ELECTRICAL CIRCUITS AND INSTRUMENTATION - 40 Marks****Unit-I: D.C. CIRCUITS AND THEOREMS**

Definition and unit for voltage, current, power, resistance, conductance, resistivity – Ohm's law – Kirchoff's current law and voltage law.

Series circuits – parallel circuits – series parallel circuits – Thevenin's, Norton's, super position and maximum power transfer theorem – Statement and explanation.

UNIT-II: A.C. CIRCUITS AND RESONANCE

AC through single pure resistance, pure inductance, pure capacitance – voltage and current relationship – the equation for power and power factor in each case - Definition for impedance, reactance, admittance, conductance, impedance, phase angle, power factor and power.

Resonance - series resonance – parallel resonance – condition for resonance – resonant frequency – Q factor – resonance curve – bandwidth.

UNIT-III: TRANSFORMERS AND MACHINES

Transformer – Ideal transformer – Construction – Working principle – EMF equation – Losses in transformer – core loss, copper loss – Efficiency – Regulation – Open Circuit, Short Circuit test on transformer – List of applications.

D.C. Machines – DC – Generator – Working principle – Applications – DC motor – working principle.

Single phase Induction motor – Types - construction & principle of operation of capacitor start induction motor - Applications-stepper motor-working principle-uses.

UNIT-IV: MEASURING INSTRUMENTS AND CRO

Indicating instruments - Basic forces for indicating instruments - construction and operation of permanent magnet moving coil Instrument – Advantages - Disadvantages of PMMC - Shunts and Multipliers - DC ammeter - DC volt meter - volt meter sensitivity principle of operation of CRO - operation of CRT Applications of CRO - Types of CRO.

UNIT-V: TRANSDUCERS & TEST INSTRUMENTS

Transducers – classification of transducer – Types - uses.

Construction, operation and application of photo electric transducer, LVDT and Load cell. Principle of working of Thermocouple - Temperature measurement using thermocouple - list of applications - Principle of working of Thermistor - Temperature measurement using thermistors – types (NTC, PTC) – List of applications.

Digital voltmeter – Types (to list only) Advantages over analog instruments.

2. INDUSTRIAL ELECTRONICS - 40 Marks**UNIT-I: POWER DEVICES AND TRIGGER CIRCUITS**

Thyristor family – Working principle, VI characteristics and applications of SCR – Definitions for holding current, latching current, dv/dt rating - Insulated gate bipolar transistor (IGBT), MOSFET and GTO – Symbol - principle of working, VI characteristics and applications - Triggering of SCR – Gate triggering – Types – Concepts of DC triggering, AC triggering, Pulse gate triggering – Pulse transformer in trigger circuit- Electrical isolation by opto isolator – Resistance capacitor firing circuit and waveform, Synchronized UJT triggering (ramp triggering) circuit and waveform.

UNIT-II: CONVERTERS AND CHOPPERS (Qualitative treatment only)

Converters – Definition – Single phase Half controlled bridge converter with R load and RL load – importance of flywheel diode - Single phase fully controlled bridge converter with resistive load - voltage and current waveforms - Single phase fully controlled bridge converter with RL load - voltage and current waveforms.

Commutation - Natural commutation - Forced commutation - Type of forced commutation.

Chopper – Definition - principle of DC chopper operation - Applications of DC chopper - Principle of working of single phase AC chopper.

UNIT-III INVERTERS & APPLICATIONS

Inverter – Definition – Requirement of an inverter – Single phase inverter with resistive load - Single phase inverter with RL load - Methods to obtain sine wave output from an inverter - Output voltage control in inverters - Parallel inverter using IGBT.

HVDC Transmission – principle – advantages – drawbacks

SMPS – Block diagram of SMPS – Working principle – advantages and disadvantages.

UPS – Working principle - Type (ON Line, OFF Line), Comparison.

UNIT-IV: PROGRAMMABLE LOGIC CONTROLLER

Relays - Basics of Input and Output module (digital input and output module) - Logic functions – AND logic, OR logic, NAND logic, EX-OR logic - Star delta starter - Conveyor control and Lift control.

UNIT-V NUMERICAL CONTROL SYSTEMS

Basic concepts of numerical control - advantages, disadvantages - applications of numerical control system - Programming systems (mention the names only) - Data processing unit.

3. COMMUNICATION ENGINEERING - 16 marks**Unit-I: Networks, Antenna and Propagation**

Networks - Symmetrical and asymmetrical networks - Equaliser - types, applications - Attenuator – types - Filters - types and definitions – circuit elements and cutoff frequencies of LPF, HPF and BPF- Antennas - Basic antenna principle - Propagation (short theory only) Ground wave propagation, sky wave, space wave propagation.

Unit-II: Amplitude Modulation

Modulations - Frequency spectrum - Relationship between wavelength and frequency, types of modulation - Amplitude modulation – Expression - AM Transmitter - Types of transmitters - AM Receiver - TRF receiver - super heterodyne radio receiver.

Unit-III: Angle and Pulse Modulation

Frequency modulation - Frequency spectrum - effects of noise in FM - comparison of AM and FM - FM Transmitters & Receiver - Direct and Indirect methods - Phase Modulation Principles

Pulse Modulation types - Generation and detection of PA, PWM, PPM, PCM, DPCM, Delta modulation.

Unit-IV : Audio systems

Principles, types, classifications, advantages and disadvantages of Microphones, Loud speakers, Audio recording and reproduction

Unit-V : Video systems

Colours TV : Principles of colour transmission and reception - LCD, LED display unit – plasma display.

4. COMPUTER HARDWARE AND NETWORKS**- 24 Marks****Unit-I: MOTHERBOARD COMPONENTS AND MEMORY STORAGE DEVICES**

Introduction : Parts – Mother board, expansion slots, memory, power supply, drives and front panel and rear panel connectors-Hardware, Software and Firmware.

Processors : Architecture and block diagram of multicore Processor

Bus Standards Overview and features of USB

Primary Memory : Introduction-Main Memory, Cache memory-DDR2-DDR3, RAM versions-1TB RAM

Secondary Storage : Hard Disk – Construction-Working Principle-Serial ATA; HDD Partition-Formatting, Troubleshooting hard disk drives.

Removable Storage : CD&DVD construction-reading & writing operations; CD-R, CD-RW; DVD-ROM, DVD-RW; construction and working of DVD Reader/Writer.

Blue-ray: Introduction

Unit-II: I/O DEVICES AND INTERFACE

Keyboard and Mouse : Keyboard : Signals – operation of membrane and mechanical keyboards – troubleshooting ; wireless Keyboard. Mouse-types, connectors, operation of Optical mouse and Troubleshooting.

Printers : Introduction – Types of printers-Operation-Construction-Features and Troubleshooting.

I/O Ports : Serial, Parallel, USB, Game Port, Bluetooth interface, IR connector, fire ware.

Displays and Graphic Cards : Panel Displays-Principles of LED, LCD and TFT Displays. SVGA Port Signals-common problems and solutions.

Modem: Working principles-common problems and solutions.

Power Supply: online and offline UPS – Working principles; Surge suppressors and spike isolators.

SMPS : Principles of Operation.

Unit-III: MAINTENANCE AND TROUBLE SHOOTING OF DESKTOP AND LAPTOPS

Standard CMOS setup, Advanced BIOS setup, Power management, beep codes and error messages.

Diagnostic Software and Viruses : Computer Viruses-Precautions-Anti-Virus Software-identify the signature of viruses-Firewalls and latest diagnostic software's.

Laptop : Difference between laptop and desktop-Types of laptop-working principles-configuring laptops and power settings.

Laptop components : Adapter-types, Battery-types and basic problems, RAM-types, CPU-types, Laptop Mother Board-Laptop Keyboard-Mouse and Touchpad-Ports.

Installation and Troubleshooting : Formatting, Partitioning and Installation of OS-Trouble Shooting Laptop Hardware problems-Preventive maintenance techniques for laptops.

Unit-IV: COMPUTER NETWORK DEVICES AND OSI LAYERS

Data Communication : Components of a data communication-Networks-Definition-Types of Connections : Point to point-multipoint; Topologies : Star, Bus, Ring, Mesh, Hybrid-Advantages and Disadvantages of each topology. Internet-Intranet-Extranet-Guided-Twisted pair, Coaxial, Fiber optic; Unguided-Radio waves-Infrared.

5. EMBEDDED SYSTEM - 10 marks**Unit-I:**

ARM PROCESSOR ARCHITECTURE : The RISC and ARM design philosophy, Embedded System Hardware.

ARM PROCESSOR FUNDAMENTALS : Data Flow Model, registers, modes of operation.

ARM Nomenclature and families.

Unit-II:

ARM INSTRUCTIONS SETS ARM and Thumb Instruction Sets, Data Processing Instructions, Branch Instructions, Load-Store Instructions, Software Interrupt Instruction, Program Status Register Instructions.

Unit-III:

CACHE MECHANISM : Introduction to cache memory, memory hierarchy and cache memory.

Unit-IV:

MEMORY PROTECTION AND MANAGEMENT UNIT : Introduction to protection unit.

Unit-V:

EMBEDDED OS AND RTOS : Fundamental Components to Embedded OS.

6. APTITUDE TEST - 20 Marks**(a) Numerical And Figurework Tests: (4 Marks)**

These tests are reflections of fluency with numbers and calculations. It shows how easily a person can think with numbers. The subject will be given a series of numbers. His/Her task is to see how the numbers go together to form a relationship with each other. He/She has to choose a number which would go next in the series.

(b) Verbal Analysis And Vocabulary Tests: (6 Marks)

These tests measure the degree of comfort and fluency with the English language. These tests will measure how a person will reason with words. The subject will be given questions with alternative answers, that will reflect his/her command of the rule and use of English language.

(c) Visual And Spatial/3-D Ability Tests: (4 Marks)

These tests are used to measure perceptual speed and acuity. The subject will be shown pictures where he/she is asked to identify the odd one out; or which comes next in the sequence or explores how easily he/she can see and turn around objects in space.

(d) Abstract Reasoning Tests: (6 Marks)

This test measures the ability to analyse information and solve problems on a complex, thought based level. It measures a person's ability to quickly identify patterns, logical rules and trends in new data, integrate this information, and apply it to solve problems.