SYLLABUS FOR COMPUTER BASED TEST FOR SUPERVISOR (IT)

Indicative Syllabus

Section-I

1. **General Intelligence & Reasoning:** The Syllabus for General Intelligence would include questions of both verbal and non-verbal type. The test may include questions on analogies, similarities, differences, space visualization, problem solving, analysis, judgement, decision making, visual memory, discrimination, observation, relationship concepts, arithmetical reasoning, verbal and figure classification, arithmetical number series etc. The test will also include questions designed to test the candidate's abilities to deal with abstract ideas and symbols and their relationships, arithmetical computations and other analytical functions.

2. **General Awareness:** Questions will be aimed at testing the candidate's general awareness of the environment around him/her and its application to society. Questions will also be designed to test knowledge of current events and of such matters of everyday observations and experience in their scientific aspect as may be expected of any educated person. The test will also include questions relating to India and its neighbouring countries especially pertaining to History, Culture, Geography, Economic Scene, General Polity and Scientific Research, etc. These questions will be such that they do not require a special study of any discipline.

Section-II: Branch (IT/Computer Science)

INTERNET & WEB TECHNOLOGIES:
HTML, Java Script, JSON, AJAX, XML, Web Servers: Tomcat, Apache, WAMP, IIS etc., Server Programming Language- Java, .Net , PHP, Web Design Tools, API Integration, DNS & Web Hosting, Static & Dynamic Web Development.

IT PROJECT MANAGEMENT:
Software Development Life Cycle, Requirement Analysis & Engineering, IT Project planning & Execution, Unified Modeling Language, Software Analysis & Design, Concepts of OOPs, Object Oriented Analysis and Design, Software Change Management, IT Vendor Management, client/ server architecture, deployment of web based applications.

SOFTWARE TOOLS & TECHNIQUES:
Content Management System (CMS), Software Installation & Configuration, Database Management System, Database design, ER diagrams, Database Client.

CYBER SECURITY AND EMERGING TECHNOLOGIES:
Secure programming techniques, OWASP top 10 vulnerabilities, concepts on IOT, Cloud Technology etc.

COMPUTER NETWORKS & OPERATING SYSTEM:
LAN Management, Routing Protocols, SMTP, VLAN, VoIP, Wireless Networks, WLAN, Wi-Fi, LAN Testing, Network Extension, VPN, Network Protection & Security Threats, Network Change Management, LAN Proxy Server, Web Servers & File Servers, Operating System: Microsoft Windows & Linux Installation & Configuration.

<div align="center">**SENIOR ACCOUNTANT EXAMINATION**</div>

Section-I

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Section II: Domain Specific

I. Indian Accounting Standards (Ind AS) and preparation of financial statements, Schedule III of the Companies Act, 2013. Ratio Analysis, Cash Flow & Fund Flow Analysis, Preparation of Bank Reconciliation Statement, Costing Concepts such a Material Cost, Labour Cost and Overheads, Fixed Cost, Variable Costs, Standard Costing, Marginal Costing, Break Even Analysis, Price Volume Relationship and Contribution Margin.

II. Budget and Budgetary Control, Types of Budget, Payback Period, Net Present Value and Internal Rate of Return.

III. Income from Salary, Income from Business & Profession, Payment of Advance Tax, Minimum Alternate Tax (MAT), Income Tax Returns, Deductions from Income, Tax Audit under Income Tax Act, 1961. TDS under Income Tax Act, Filing of e-TDS Return under Income Tax Act.

IV. Central Excise, Customs Duty and Service Tax, TDS under various Sections, Filing of e-TDS Return, DVAT, Central Sales Tax Act and highlights of Proposed Goods and Services Tax Act (GST), GST Returns, TDS under Goods & Service Tax.

V. Financial Models of Infrastructure Projects (SPV, PPP).

VI. Raising of debts from domestic market and international market.

VII. Raising of funds through equity.

VIII. Project Appraisal for investment.

IX. Internal Audit & Internal Control and Investigation.

X. Utility of physical verification of fixed assets.

XI. Methods of charging depreciation on assets.

JUNIOR ENGINEERS (MECHANICAL) EXAMINATION

Indicative Syllabus

The standard of the questions in Engineering subjects will be approximately of the level of Diploma in Engineering(Mechanical) from a recognized Institute, Board or University recognized by All India Board of Technical Education. All the questions will be set in SI units. The details of the syllabus are given below:

Section-I

1. **General Intelligence & Reasoning:** The Syllabus for General Intelligence would include questions of both verbal and non-verbal type. The test may include questions on analogies, similarities, differences, space visualization, problem solving, analysis, judgement, decision making, visual memory, discrimination, observation, relationship concepts, arithmetical reasoning, verbal and figure classification, arithmetical number series etc. The test will also include questions designed to test the candidate's abilities to deal with abstract ideas and symbols and their relationships, arithmetical computations and other analytical functions.

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Section-II : Mechanical Engineering

Theory of Machines and Machine Design

Concept of simple machine, Four bar linkage and link motion, Flywheels and fluctuation of energy, Power transmission by belts – V-belts and Flat belts, Clutches – Plate and Conical clutch, Gears – Type of gears, gear profile and gear ratio calculation, Governors – Principles and classification, Riveted joint, Cams, Bearings, Friction in collars and pivots.

Engineering Mechanics and Strength of Materials

Equilibrium of Forces, Law of motion, Friction, Concepts of stress and strain, Elastic limit and elastic constants, Bending moments and shear force diagram, Stress in composite bars, Torsion of circular shafts, Bucking of columns – Euler's and Rankin's theories, Thin walled pressure vessels.

Thermal Engineering

Properties of Pure Substances: p-v & P-T diagrams of pure substance like H_2O, Introduction of steam table with respect to steam generation process; definition of saturation, wet & superheated status. Definition of dryness fraction of steam, degree of superheat of steam. H-s chart of steam (Mollier's Chart).

1st Law of Thermodynamics: Definition of stored energy & internal energy, 1st Law of Thermodynamics of cyclic process, Non Flow Energy Equation, Flow Energy & Definition of Enthalpy, Conditions for Steady State Steady Flow; Steady State Steady Flow Energy Equation.

2nd Law of Thermodynamics: Definition of Sink, Source Reservoir of Heat, Heat Engine, Heat Pump & Refrigerator; Thermal Efficiency of Heat Engines & co-efficient of performance of Refrigerators, Kelvin – Planck & Clausius Statements of 2nd Law of Thermodynamics, Absolute or Thermodynamic Scale of temperature, Clausius Integral, Entropy, Entropy change calculation of ideal gas processes. Carnot Cycle & Carnot Efficiency, PMM-2; definition & its impossibility.

Air standard Cycles for IC engines: Otto cycle; plot on P-V, T-S Planes; Thermal Efficiency, Diesel Cycle; Plot on P-V, T-S planes; Thermal efficiency.

IC Engine Performance, IC Engine Combustion, IC Engine Cooling & Lubrication.

Rankine cycle of steam: Simple Rankine cycle plot on P-V, T-S, h-s planes, Rankine cycle efficiency with & without pump work.

Boilers; Classification; Specification; Fittings & Accessories: Fire Tube & Water Tube Boilers.

Air Compressors & their cycles; Refrigeration cycles; Principle of a Refrigeraton Plant; Nozzles & Steam Turbines

Fluid Mechanics & Machinery

Properties & Classification of Fluid: ideal & real fluids, Newton's law of viscosity, Newtonian and
Non-Newtonian fluids, compressible and incompressible fluids.

Fluid Statics: Pressure at a point.

Measurement of Fluid Pressure: Manometers, U-tube, Inclined tube.

Fluid Kinematics: Stream line, laminar & turbulent flow, external & internal flow, continuity equation.

Dynamics of ideal fluids: Bernoulli's equation, Total head; Velocity head; Pressure head; Application
of Bernoulli's equitation.

Measurement of Flow rate Basic Principles: Venturimeter, Pilot tube, Orifice meter.

Hydraulic Turbines: Classifications, Principles.

Centrifugal Pumps: Classifications, Principles, Performance.

Production Engineering

Classification of Steels: mild steal & alloy steel, Heat treatment of steel, welding – Arc

Welding, Gas Welding, Resistance Welding, Special Welding Techniques i.e. TIG, MIG, etc. (Brazing & Soldering), Welding Defects & Testing; NDT, Foundry & Casting – methods, defects, different casting processes, Forging, Extrusion, etc, Metal cutting principles, cutting tools, Basic Principles of machining with (i) Lathe (ii) Milling (iii) Drilling (iv) Shaping (v) Grinding, Machines, tools & manufacturing processes.

Engineering Drawing

- Introduction to orthographic projection, First angle and Third angle method, their symbols
- Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces
- Introduction to isometric projections
- Conversion of orthographic views into isometric view /projection.

JUNIOR ENGINEERS (ELECTRICAL) EXAMINATION

Indicative Syllabus

The standard of the questions in Engineering subjects will be approximately of the level of Diploma in Engineering (Electrical) from a recognized Institute, Board or University recognized by All India Board of Technical Education. All the questions will be set in SI units. The details of the syllabus are given below:

Section-I

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Section-II : Electrical Engineering

Basic concepts: Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.

Circuit law: Kirchhoff's law, Simple Circuit solution using network theorems.

Magnetic Circuit: Concepts of flux, mmf, reluctance, Different kinds of magnetic materials, Magnetic calculations for conductors of different configuration e.g. straight, circular, solenoidal, etc. Electromagnetic induction, self and mutual induction.

AC Fundamentals: Instantaneous, peak, R.M.S. and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Tank Circuit. Poly Phase system – star and delta connection, 3 phase power, DC and sinusoidal response of R-Land R-C circuit.

Measurement and measuring instruments: Measurement of power (1 phase and 3 phase, both active and re-active) and energy, 2 wattmeter method of 3 phase power measurement. Measurement of frequency and phase angle. Ammeter and voltmeter (both moving oil and moving iron type), extension of range wattmeter, Multimeters, Megger, Energy meter AC

Bridges. Use of CRO, Signal Generator, CT, PT and their uses. Earth Fault detection.

Electrical Machines: (a) D.C. Machine – Construction, Basic Principles of D.C. motors and generators, their characteristics, speed control and starting of D.C. Motors. Method of braking motor, Losses and efficiency of D.C. Machines. (b) 1 phase and 3 phase transformers – Construction, Principles of operation, equivalent circuit, voltage regulation, O.C. and S.C. Tests, Losses and efficiency. Effect of voltage, frequency and wave form on losses. Parallel operation of 1 phase /3 phase transformers. Auto transformers. (c) 3 phase induction motors, rotating magnetic field, principle of operation, equivalent circuit, torque-speed characteristics, starting and speed control of 3 phase induction motors. Methods of braking, effect of voltage and frequency variation on torque speed characteristics.

Fractional Kilowatt Motors and Single Phase Induction Motors: Characteristics and applications.

Synchronous Machines - Generation of 3-phase e.m.f. armature reaction, voltage regulation, parallel operation of two alternators, synchronizing, control of active and reactive power. Starting and applications of synchronous motors.

Generation, Transmission and Distribution – Different types of power stations, Load factor, diversity factor, demand factor, cost of generation, inter-connection of power stations. Power factor improvement, various types of tariffs, types of faults, short circuit current for symmetrical faults. Switchgears – rating of circuit breakers, Principles of arc extinction by oil and air, H.R.C. Fuses, Protection against earth leakage / over current, etc. Buchholtz relay, Merz-Price system of protection of generators & transformers, protection of feeders and bus bars. Lightning arresters, various transmission and distribution system, comparison of conductor materials, efficiency of different system. Cable – Different type of cables, cable rating and derating factor.

Estimation and costing: Estimation of lighting scheme, electric installation of machines and relevant IE rules. Earthing practices and IE Rules.

Utilization of Electrical Energy: Illumination, Electric heating, Electric welding, Electroplating, Electric drives and motors.

Basic Electronics : Working of various electronic devices e.g. P N Junction diodes, Transistors (NPN and PNP type), BJT and JFET. Simple circuits using these devices.

Properties of Matter –

- Elasticity: definition of stress and strain, moduli of elasticity, Hooke's law, significance of stress-strain curve.
- Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure,Fortin's Barometer and its applications.
- Surface tension: concept, units, cohesive and adhesive forces, angle of contact,applications of surface tension, effect of temperature and impurity on surface tension.
- Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems.

<u>Hydrodynamics</u>

- Fluid motion, stream line and turbulent flow, Reynold's number, Equation of continuity, Bernoulli's Theorem and its applications.

<u>Engineering Drawing:</u>

- Introduction to orthographic projection, First angle and Third angle method, their symbols

- Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces

- Introduction to isometric projections

- Conversion of orthographic views into isometric view /projection.

<h1 style="text-align:center">JUNIOR ENGINEERS (ELECTRONICS AND COMMUNICATION) EXAMINATION</h1>

Indicative Syllabus

The standard of the questions in Engineering subjects will be approximately of the level of Diploma in Engineering (E&C) from a recognized Institute, Board or University recognized by All India Board of Technical Education. All the questions will be set in SI units. The details of the syllabus are given below:

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Section-II : Electronics & Communication Engineering

Principles of Electronic Communication
ANALOG MODULATION: Concept of frequency translation. Amplitude Modulation: Description of full AM, DSBSC, SSB and VSB in time and frequency domains, methods of generation & demodulation, descriptions of FM signal in time and frequency domains
PULSE ANALOG MODULATION: Ideal sampling, Sampling theorem, aliasing, interpolation, natural and flat top sampling in time and frequency domains
PCM & DELTA MODULATION SYSTEMS: Uniform and Non-uniform quantization. PCM and delta modulation, Signal to quantization noise ratio in PCM and delta modulation.
DIGITAL MODULATION: Baseband transmission: Line coding (RZ, NRZ), Inter symbol interference (ISI), pulse shaping, Nyquist criterion for distortion free base band transmission, raised cosine spectrum. Pass band transmission: Geometric interpretation of signals, orthogonalization.
SPREAD-SPECTRUM MODULATION: Introduction, Pseudo-Noise sequences, direct sequence spread spectrum (DSSS) with coherent BPSK, processing gain, probability of error, frequency-hop spread spectrum (FHSS). Application of spread spectrum: CDMA

Electronics Devices and Circuits
Unit 1-Semiconductor and Diodes

Definition, Extrinsic/Intrinsic, N-type & p-type PN Junction Diode Forward and Reverse Bias Characteristics Zener Diode - Principle, characteristics, construction, working Diode Rectifiers- Half Wave and Full Wave Filters -C, LC and PI Filters

Unit 2-Bipolar Junction Transistor (BJT)

NPN and PNP Transistor Operation and characteristics Common Base Configuration- characteristics and working Common Emitter Configuration - characteristics and working Common Base Configuration characteristics and working High frequency model of BJT Classification of amplifiers, negative feedback

Unit 3- Field Effect Transistors

FET-Working Principle, Classification MOSFET Small Signal model N-Channel/ P-Channel MOSFETS characteristics, enhancement and depletion mode, MOSFET as a Switch Common Source Amplifiers Uni-Junction Transistor-equivalent circuit and operation

Unit 4-SCR DIAC & TRIAC

SCR Construction, operation, working, characteristics DIAC Construction, operation, working, characteristics TRIAC-Construction, operation, working, characteristics SCR and MOSFET as a Switch, DIAC as bidirectional switch Comparison of SCR. DIAC, TRIAC, MOSFET

Unit 5-Amplifiers and Oscillators

Feedback Amplifiers - Properties of negative Feedback, impact of feedback on different parameters Basic Feedback Amplifier Topologies: Voltage Series, Voltage Shunt Current Series, Current Shunt Oscillator Basic Principles, Crystal Oscillator, Non-linear/ Pulse Oscillator

Digital Electronics

Unit 1- Number Systems & Boolean Algebra

Introduction to different number systems - Binary, Octal, Decimal, Hexadecimal Conversion from one number system to another. Boolean variables-Rules and laws of Boolean Algebra De-Morgan's Theorem Karnaugh Maps and their use for simplification of Boolean expressions

Unit 2-Logic Gates

Logic Gates - AND, OR, NOT, NAND, NOR, XOR, XNOR: Symbolic representation and truth table Implementation of Boolean expressions and Logic Functions using gates Simplification of expressions

Unit 3-Combinational Logic Circuits

Arithmetic Circuits - Addition, Subtraction, 1's 2's Complement, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel and Series Adders Encoder, Decoder Multiplexer -2 to 1 MUX, 4 to 1 MUX, 8 to 1 MUX. Applications Demultiplexer - 1 to 2 DEMUX, 1-4 DEMUX, 1- 8 DEMUX

Unit 4-Sequential Logic Circuits

Flip Flops SRJK, T, D, FF, JK-MS, Triggering Counters 4 bit Up - Down Counters, Asynchronous/Ripple Counter, Decade Counter- Mod 3, Mod 7 Counter, Johnson Counter, Ring Counter Registers-4bit Shift Register: Serial In Serial Out, Serial in Parallel Out, Parallel In Serial Out, Parallel In Parallel Out

Unit 5-Memory Devices

Classification of Memories RAM Organization, Address Lines and Memory Sixe, Static RAM, Bipolar RAM, cell Dynamic RAM, D RAM, DDR RAM Read Only memory- ROM organization, Expanding memory, PROM, EPROM, EEPROM, Flash memory Data Converters -Digital to Analog converters, Analog to Digital Converters

Electronic Measurement and Instrumentation

Unit-1 Basics of Measurements and Bridges

Accuracy & precision, Resolution Types of Errors DC Bridges - Wheatstone and Kelvin Double Bridge AC Bridges Maxwell's Bridge, Hay's Bridge, Anderson Bridge, De-Sauty's Bridge

Unit-II Potentiometer

Basic DC slide wire Potentiometer Crompton's DC Potentiometer Applications of DC Potentiometer AC Potentiometers Applications of AC Potentiometers

Unit-III Measuring Instruments

Permanent Magnet Moving Coil Instruments (PMMC) Moving Iron type Instruments (MI) Electro Dynamo Type Instruments Single Phase Energy Meter

Unit-IV Electronic Instruments

Electronic Voltmeter and Digital Voltmeter Electronic Multimeters Q-Meter Vector Impedance Meter

Unit-V Oscilloscopes

Cathode ray tube: construction, operation, screens, graticules Vertical deflection system, Horizontal deflection system, Delay line, Measurement of frequency, time delay, phase angle and modulation index (trapezoidal method) Oscilloscope probe: Structure of 1:1 and 10:1 probe, Multiple Trace CRO

Unit-VI Transducers

Classification, Selection Criteria, Characteristics, Construction, Working Principles and Application of following Transducers: RTD, Thermocouple, Thermistor LVDT, Strain Gauge Load Cell Piezoelectric Transducers

Electric Circuits & Network

Unit-1 Basics of Network and Network Theorem

Node and Mesh Analysis Superposition Theorem Thevenin Theorem Norton Theorem Maximum Power transfer theorem Reciprocity Theorem

Unit-2 Graph Theory

Graph of network, tree, incidence matrix F- Tie Set Analysis F-Cut Set Analysis Analysis of resistive network using cut-set and tie-set Duality.

Unit-3 Time Domain and Frequency Domain Analysis

Solution of first and second order differential equations for Series and parallel R-L, R-C, R-L-C circuits Initial and Final conditions in network elements Forced and Free response, time constants Steady State and Transient State Response Analysis of electrical circuits using Laplace Transform for standard inputs (unit, Ramp, Step)

Unit-4 Trigonometric and exponential Fourier series

Discrete spectra and symmetry of waveform, Steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values Fourier transform and continuous spectra

Unit-5 Two Port Network

Two Port Network Open Circuit Impedance Parameters Short Circuit Admittance Parameters Transmission Parameters Hybrid Parameters Interrelationship of Two Port Network Inter Connection of Two Port Network

Microcontroller and Applications

Unit I Introduction

Introduction to Microprocessors and Microcontrollers, Architectures (8085,8086) Intel MCS51 family features-8051-organization and architecture

Unit II Programming with 8051

10 8051 instruction set, addressing modes, conditional instructions, 1/0 Programming,

Arithmetic logic instructions, single bit instructions, interrupt handling, programming counters, timers and Stack

Unit III

MCS51 and external Interfaces 8 User interface - keyboard, LCD, LED, Real world interface- ADC, DAC, SENSORS Communication interface.

Unit IV C programming with 8051

81/0 Programming, Timers/counters, Serial Communication, Interrupt, User Interfaces- LCD, Keypad, LED and communication interfaces [RS232].

Unit V

ARM processor core based microcontrollers 14 Need for RISC Processor-ARM processor fundamentals, ARM core based controller [LPC214X], 10 ports, ADC/DAC, Timers.

Consumer Electronics

UNIT-I Audio Fundamentals and Devices

Basic characteristics of sound signal, Audio level metering, decibel level in acoustic measurement, Microphone & Types, speaker types & working principle, Sound recording principle & types

UNIT-II Audio Systems

CD player, home theatre sound system, surround sound, Digital console block diagram, working principle, applications, FM tuner, ICs used in FM tuner TDA 7021T, PA address system

UNIT-III Television Systems

Monochrome TV standards, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution, Composite video signal, Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance, Different types of TV camera, Transmission standards

UNIT-IV Television Receivers and Video Systems

PAL-D colour TV receiver, Digital TVs:- LCD, LED, PLASMA, HDTV, 3-D TV, projection TV, DTH receiver, Video interface, Digital Video, SDI, HDMI Multimedia Interface Digital Video Interface, CD and DVD player

UNIT-V Home/Office Appliances

Diagrams, operating principles and controller for FAX and Photocopier, Microwave Oven, Washing Machine, Air conditioner and Refrigerators, Digital camera and cam coder

Digital Communication Systems

UNIT1

Block diagram and sub-system description of a digital communication system. Sampling of low-pass and band-pass signals, PAM, PCM, signal to quantization noise ratio analysis of linear and nonlinear quantizers, Line codes and bandwidth considerations; PCM TDM hierarchies, frame structures, frame synchronization and bit stuffing.

UNIT 2

Quantization noise analysis of DM and ADM; DPCM and ADPCM; Low bit rate coding of speech and video signals. Baseband transmission, matched filter, performance in additive Gaussian noise; Intersymbol interference (ISI), Nyquist criterion for zero ISI, sinusoidal roll- off filtering, correlative coding, equalizers and adaptive equalizers; Digital subscriber lines.

UNIT 3

Geometric representation of signals, maximum likelihood decoding; Correlation receiver, equivalence with matched filter.Generation, detection and probability of error analysis of OOK, BPSK, coherent and non-coherent FSK, QPSK and DPSK; QAM, MSK and multicarrier modulation; Comparison of bandwidth and bit rate of digital modulation schemes.

UNIT 4

Introduction to Information and Coding Theories: Information Theory: information measures, Shannon entropy, differential entropy, mutual information, capacity theorem for point-to-point channels with discrete and continuous alphabets. Coding Theory: linear block codes - definitions, properties, bounds on minimum distance (singleton, Hamming, GV, MRRW), soft versus hard decision decoding, some specific codes (Hamming, RS,Concatenated); Convolutional codes-structure, decoding (the Viterbi and BCR algorithms); Turbo codes, LDPC codes

Electronic Equipment Maintenance

Unit 1:

Fundamental Troubleshooting Procedures inside An Electronic Equipment: Reading Drawings And Diagrams-Block Diagram, Circuit Diagram, Wiring Diagram, Dis-assembly and re-assembly of equipment, Equipment Failures and causes such as poor design, production deficiencies, careless storage and transport, inappropriate operating conditions, Nature of faults. Fault location procedure, Fault finding aids-Service and maintenance manuals and instruction manuals, Test and Measuring instruments, special tools Troubleshooting techniques, Approaching components for tests, Grounding systems in Electronic Equipment. Temperature sensitive Intermittent problems Corrective actions, Situations where repairs should not be attempted.

Unit 2:

Passive Components and Their Testing Passive Components- Resistors, Capacitors, Inductors Failures in fixed resistors, testing of resistors, variable resistors, variable resistors as potentiometers, failures in potentiometers, testing of potentiometers, servicing potentiometers, LDRs and Thermistors Types of capacitors and their performance, Failures in capacitors, testing of capacitors and precautions therein, variable capacitor types, Testing of inductors and inductance measurement

Unit 3:

Testing of Semiconductor Devices Types of semiconductor devices, Causes of failure in Semiconductor Devices, Types of failure Test procedures for Diodes, special types of Diodes, Bipolar Junction Transistors, Field Effect Transistors, Thyristors Operational Amplifiers, Fault diagnosis in op-amp circuits

Unit 4:

Logic IC families, Packages in Digital ICs, IC identification, IC pin-outs, Handling ICs, Digital troubleshooting methods - typical faults, testing digital ICs with pulse generators Logic clip, Logic Probe, Logic Pulser, Logic Current Tracer, Logic Comparator Special consideration for fault diagnosis in digital circuits Handling precautions for ICs sensitive to static electricity Testing flip-flops, counters, registers, multiplexers and de-multiplexers, encoders and decoders; Tri-state logic.

Unit 5:

Rework and Repair of Surface Mount Assemblies Surface Mount Technology and surface mount devices Surface Mount Semiconductor packages - SOIC, SOT, LCCC, LGA, BGA, COB, Flatpacks and Quad Packs, Cylindrical Diode Packages, Packaging of Passive Components as SMDS Repairing Surface Mount PCBs, Rework Stations

Linear Integrated Circuits

UNIT 1-IC Fabrication and Circuit Configuration for Linear IC

Advantages of ICs over discrete components - Manufacturing process of monolithic s Construction of monolithic bipolar transistor Monolithic diodes- Integrated Resistors Monolithic

Capacitors - Inductors. Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BIT Differential amplifier with active loads, General operational amplifier stages and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.

UNIT II Applications Of Operational Amplifiers

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower. Vto-1 and 1-to-V converters, adder, subtractor, Instrumentation amplifier, integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III Analog Multiplier and PLL

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell - Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

UNIT IV Analog to digital and digital to analog converters

Analog and Digital Data Conversions, D/A converter-specifications-weighted resistor type. R-2R Ladder type, Voltage Mode and Current-Mode R2R Ladder types switches for D/A converters, high speed sample-and-hold circuits, A/D Converters specifications Flash type- Successive Approximation type - Single Slope type- Dual Slope type A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.

UNIT V Waveform generators and special function ICs

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators - Three terminal fixed and adjustable voltage regulators IC 723 general purpose regulator Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto couplers and fibre optic IC

Embedded Systems:

Unit I Embedded C basics operators for Arduino

Familiarizing with the Arduino (DE Sketch designing for Arduino Communication interface using serial port Basic understanding of the code with boolean operations, pointer access operations, bitwise operations, compounded operations

Unit II Embedded C control structure blocks

Looping mechanism-for, do and while. The branching operations based on conditions expression

Unit III Introduction to Arduino Mega

Arduino Mega specifications including power ratings, digital and analog peripherals Difference between the C language and Embedded C language Arduino Mega Ports, Pins, Digital and Analog Peripherals

Unit IV Communication with Arduino

Different communication modules available with their real-life application Communication interface

Mobile and Wireless Communication

Unit 1- Overview of Cellular Systems

Evolution 28/3G/4G/5G Cellular Concepts Frequency reuse, Cochannel and Adjacent channel Interference

Unit – II Wireless propagation

Link budget, Free-space path loss, Noise figure of receiver Multipath fading, Shadowing, Fading margin, Shadowing margin

Unit III Antenna diversity, wireless channel capacity and MIMO

Unit IV Overview of CDMA, OFDM and LTE

Industrial Automation

Unit I-Industrial automation overview and data acquisition

Architecture of Industrial Automation Systems. Measurement Systems Characteristics Data Acquisition Systems

Unit II-Control Generation

Introduction to Automatic Control P-I-D Control Feedforward Control Ratio Control The branching operations based on conditions expression

Unit III Sequential control and PLC

Introduction to Sequence Control, PLC, RLL PLC Hardware Environment

Unit IV Industrial control application

Hydraulic Control Systems Pneumatic Control Systems Energy Savings with Variable Speed Drives Introduction To CNC Machines:

Microwave and Radar

Unit 1-Introduction to Microwaves

History and applications of Microwaves Mathematical Model of Microwave Transmission Microwave transmission modes, waveguides and transmission lines, Impedance Matching Microwave Network Analysis

Unit II- Passive and Active Microwave Devices

Directional Coupler, Power Divider, Attenuator, Resonator. Microwave active components: Diodes, Transistors, Microwave Tubes

Unit III -Microwave Design Principles-

Microwave Filter Design, Microwave Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Antennas

Unit IV -

Microwave Measurements, Microwave Systems, Effect of Microwaves on human body.

Computer Networking and Data Communication

Unit 1-Introduction to data communication.

Concept of analog and digital signals. Bandwidth. Network architecture. Basics of OSI and TCP/IP reference models. Types of Computer Networks - Personal Area Network, Local Area Netwrk, Metropolitan Area Network, Wide Area Network, Internetwork. Computer Network Topologies-Point to Point, Bus topology, Star topology, ring topology, mesh topology, tree topology, Daisy Chain, Hybrid Topology, Computer Network Model. Transmission media. Wired and wireless connectivity.

Unit 2-Digital & Analog Transmission.

Digital Transmission - Digital to Digital Conversion, Line Coding, Unipolar Encoding, Polar Encoding, Bipolar Encoding, block Coding Analog Transmission Analog-to-Digital Conversion, Digital to analog Conversion, Analog to Analog Conversion. Sampling, Quantization, Encoding, Transmission Modes.

Unit 3-Wireless Communication

Radio, Micowave, Infra-red, Light Transmission. Wireless Communication Standards,

Characterization of the Wireless Channel, Receiver Techniques for Fading Dispersive Channels, Mobility Management in Wireless Networks, Mobile IP, Mobile Ad hoc Networks, Ad hoc Routing Protocols, Performance Analysis of DSR and CBRP, Cluster Techniques, Incremental Cluster Maintenance Scheme, Space time Coding for Wireless Communication.

Unit 4- Data Link Layer Technologies

Types of Network Routing, Network Layer Protocols. FDM, TDM and CDMA. Circuit and packet switching. Frame relay and ATM switching. ISDN. Local area network protocols. Fibre optic networks. Satellite networks. Data link layer design issues: its functions and protocols. Internet protocol. Routing algorithms. Congestion control algorithms. IP addressing schemes. Internetworking and sub-netting. Error Detection and Correction- Types of Errors, Detection, Correction Switching and Data link layer, data link control and protocols

Unit 5-Transmission Media & Transmission Control protocol

Magnetic Media, Twisted Pair Cable, Coaxial Cable, Power Lines, Fiber Optics. Protocol- Features, Header, Addressing, Connection Management, Error Control and Flow Control, Multiplexing, Congestion Control, Timer Management, Crash Recover

Indicative Syllabus

The standard of the questions in Engineering subjects will be approximately of the level of Diploma in Engineering(Civil) in concerned discipline from a recognized Institute, Board or University recognized by All India Board of Technical Education. All the questions will be set in SI units. The details of the syllabus are given below:

Section-I

1. **General Intelligence & Reasoning:** The Syllabus for General Intelligence would include questions of both verbal and non-verbal type. The test may include questions on analogies, similarities, differences, space visualization, problem solving, analysis, judgement, decision making, visual memory, discrimination, observation, relationship concepts, arithmetical reasoning, verbal and figure classification, arithmetical number series etc. The test will also include questions designed to test the candidate's abilities to deal with abstract ideas and symbols and their relationships, arithmetical computations and other analytical functions.

2. **General Awareness:** Questions will be aimed at testing the candidate's general awareness of the environment around him/her and its application to society. Questions will also be designed to test knowledge of current events and of such matters of everyday observations and experience in their scientific aspect as may be expected of any educated person. The test will also include questions relating to India and its neighbouring countries especially pertaining to History, Culture, Geography, Economic Scene, General Polity and Scientific Research, etc. These questions will be such that they do not require a special study of any discipline.

Section-II : Civil Engineering

Building Materials: Physical and Chemical properties, classification, standard tests, uses and manufacture/quarrying of materials e.g. building stones, silicate based materials, cement (Portland), asbestos products, timber and wood based products, laminates, bituminous materials, paints, varnishes.

Estimating, Costing and Valuation: estimate, glossary of technical terms, analysis of rates, methods and unit of measurement, Items of work – earthwork, Brick work (Modular & Traditional bricks), RCC work, Shuttering, Timber work, Painting, Flooring, Plastering. Boundary wall, Brick building, Water Tank, Septic tank, Bar bending schedule, Centre line method, Mid-section formula, Trapezodial formula, Simpson's rule. Cost estimate of Septic tank, flexible pavements, Tube well, isolates and combined footings, Steel Truss, Piles and pile-caps. Valuation – Value and cost, scrap value, salvage value, assessed value, sinking fund, depreciation and obsolescence, methods of valuation.

Surveying : Principles of surveying, measurement of distance, chain surveying, working of prismatic compass, compass traversing, bearings, local attraction, plane table surveying, theodolite traversing, adjustment of theodolite, Levelling, Definition of terms used in levelling, contouring, curvature and refraction corrections, temporary and permanent adjustments of dumpy level, methods of contouring, uses of contour map, tachometric survey, curve setting, earth work calculation, advanced surveying equipment.

<u>Soil Mechanics</u>: Origin of soil, phase diagram, Definitions-void ratio, porosity, degree of saturation, water content, specific gravity of soil grains, unit weights, density index and interrelationship of different parameters, Grain size distribution curves and their uses. Index properties of soils, Atterberg's limits, ISI soil classification and plasticity chart. Permeability of soil, coefficient of permeability, determination of coefficient of permeability, Unconfined and confined aquifers, effective stress, quick sand, consolidation of soils, Principles of consolidation, degree of consolidation, pre-consolidation pressure, normally consolidated soil, e-log p curve, computation of ultimate settlement. Shear strength of soils, direct shear test, Vane shear test, Triaxial test. Soil compaction, Laboratory compaction test, Maximum dry density and optimum moisture content, earth pressure theories, active and passive earth pressures, Bearing capacity of soils, plate load test, standard penetration test.

<u>Hydraulics</u>: Fluid properties, hydrostatics, measurements of flow, Bernoulli's theorem and its application, flow through pipes, flow in open channels, weirs, flumes, spillways, pumps and turbines.

<u>Irrigation Engineering</u>: Definition, necessity, benefits, 2II effects of irrigation, types and methods of irrigation, Hydrology – Measurement of rainfall, run off coefficient, rain gauge, losses from precipitation – evaporation, infiltration, etc. Water requirement of crops, duty, delta and base period, Kharif and Rabi Crops, Command area, Time factor, Crop ratio, Overlap allowance, Irrigation efficiencies. Different type of canals, types of canal irrigation, loss of water in canals. Canal lining – types and advantages. Shallow and deep to wells, yield from a well. Weir and barrage, Failure of weirs and permeable foundation, Slit and Scour, Kennedy's theory of critical velocity. Lacey's theory of uniform flow. Definition of flood, causes and effects, methods of flood control, water logging, preventive measure. Land reclamation, Characteristics of affecting fertility of soils, purposes, methods, description of land and reclamation processes. Major irrigation projects in India.

<u>Transportation Engineering</u>: Highway Engineering – cross sectional elements, geometric design, types of pavements, pavement materials – aggregates and bitumen, different tests, Design of flexible and rigid pavements – Water Bound Macadam (WBM) and Wet Mix Macadam (WMM), Gravel Road, Bituminous construction, Rigid pavement joint, pavement maintenance, Highway drainage, Railway Engineering- Components of permanent way – sleepers, ballast, fixtures and fastening, track geometry, points and crossings, track junction, stations and yards. Traffic Engineering – Different traffic survey, speed-flow-density and their interrelationships, intersections and interchanges, traffic signals, traffic operation, traffic signs and markings, road safety.

<u>Environmental Engineering</u>: Quality of water, source of water supply, purification of water, distribution of water, need of sanitation, sewerage systems, circular sewer, oval sewer, sewer appurtenances, sewage treatments. Surface water drainage. Solid waste management – types, effects, engineered management system. Air pollution – pollutants, causes, effects, control. Noise pollution – cause, health effects, control.

<u>Structural Engineering</u>

<u>Theory of structures</u>: Elasticity constants, types of beams – determinate and indeterminate, bending moment and shear force diagrams of simply supported, cantilever and over hanging

beams. Moment of area and moment of inertia for rectangular & circular sections, bending moment and shear stress for tee, channel and compound sections, chimneys, dams and retaining walls, eccentric loads, slope deflection of simply supported and cantilever beams, critical load and columns, Torsion of circular section.

Concrete Technology: Properties, Advantages and uses of concrete, cement aggregates, importance of water quality, water cement ratio, workability, mix design, storage, batching, mixing, placement, compaction, finishing and curing of concrete, quality control of concrete, hot weather and cold weather concreting, repair and maintenance of concrete structures.

RCC Design: RCC beams-flexural strength, shear strength, bond strength, design of singly reinforced and double reinforced beams, cantilever beams. T-beams, lintels. One way and two way slabs, isolated footings. Reinforced brick works, columns, staircases, retaining wall, water tanks (RCC design questions may be based on both Limit State and Working Stress methods).

Steel Design: Steel design and construction of steel columns, beams roof trusses plate girders.

पाठ्यक्रम - सहायक राजभाषा अधिकारी एवं हिन्दी अनुवादक

- शब्द विचार उपसर्ग प्रत्यय
- शब्द भेद
- लिंग, वचन कारक, काल
- शब्द रूपांतर
- शब्द अर्थ, भिन्न-भिन्न अर्थ, अनेकार्थी शब्द
- पर्यायवाची, विलोम शब्द
- संधि, समास
- वाच्य
- अनुलोम-विलोम
- अनुस्वार, अनुनासिकता
- अव्यव
- मुहावरे-लोकोक्ति
- वाक्य-सरंचना
- संज्ञा, सर्वनाम, विशेषण, क्रिया विशेषण
- छंद, अलंकार, रस, अभिव्यञ्जना
- वाक्य सरंचना, शुद्धि-अशुद्धि
- हिंदी साहित्य का इतिहास
- पत्र, कार्यालय आदेश, कार्यालय ज्ञापन, टिप्पणी, सूचना & परिपत्र की महत्ता और अंतर
- राजभाषा संबंधी सैवंधानिक उपबंध, राजभाषा अधिनियम
- गद्य-पद्य आधारित प्रश्न
- राजभाषा हिंदी के संवैधानिक प्रावधान
- राजभाषा संबंधी आदेश/ निर्देश
- राजभाषा अधिनियम, 1963
- राजभाषा नियम, 1976
- राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम और उसमें निर्दिष्ट क्षेत्रवार लक्ष्य
- संसदीय राजभाषा समिति का परिचय एवं समिति की सिफ़ारिशें
- अंग्रेजी से हिंदी तथा हिंदी से अंग्रेजी अनुवाद
- अंग्रेजी- हिंदी तथा हिंदी-अंग्रेजी प्रशासनिक एवं तकनीकी शब्दावली