SYLLABUS FOR WRITTEN EXAM FOR THE POST OF
SUPERINTENDING ENGINEER (DRILLING) [POST CODE - (DR10)]

- ✓ **Drilling Fluids**

Basic Functions of a Drilling Fluid; Types of Drilling Fluids; Fluid Rheology

- ✓ **Fluid Mechanics for Drilling**

- ✓ **Well Control**

Procedures and Principles

- ✓ **Roller-Cone and Polycrystalline Diamond Drill Bits**

Different bit types, Cutting structure for soft and hard formations, Roller-Cone Bit Components (Bearing, Seal, and Lubrication Systems), bit hydraulics, IADC bit classification system, bit nomenclature, Matrix-body PDC bits, PDC Cutters, Basic PDC Bit Design Principles, IADC Dull Grading System, Bit Selection and Operating Practices.

- ✓ **Directional Drilling**

Applications; Directional-Well Profiles; directional-drilling tools; rotary-steerable systems
(RSS); Directional Survey; Survey Instruments; BHA Design for Directional Control

- ✓ **Casing Design**

Design Objectives; Design Methods; Casing Setting Depth Selection;

- ✓ **Wellhead Systems**

- ✓ **Cementing**

Methods and Hardware e.g. Floating equipment, cementing plugs, stage tools, centralizers, and scratchers.

- ✓ **Drilling Problems and Solutions**

Pipe Sticking; Differential-Pressure Pipe Sticking; Mechanical Pipe Sticking (Drilled Cuttings accumulation; Borehole Instability; Key Seating).
Loss circulation; Loss circulation zones (total loss/ partial loss) and causes; Prevention of Lost Circulation; Remedial Measures.
Drill pipe Failures; Twist off; Parting; failure as a result of Collapse and Burst; Fatigue; Pipe Failure Prevention.
Borehole Instability; Definition and Causes; Types and Associated Problems: Hole Closure, Hole Enlargement, Fracturing, Borehole collapse. Principles of Borehole Instability, Borehole Instability Prevention.

- ✓ **Well Planning**

Objectives (Safety; Minimum Cost; Usable Holes); Well-Type Classification; Flow path for well planning; cost per foot analysis; well completions.

- ✓ **Emerging Drilling Technologies**

SYLLABUS FOR WRITTEN EXAM FOR THE POST OF
<u>SUPERINTENDING MEDICAL OFFICER (RADIOLOGY) [POST CODE – (MD 11)]</u>

- Radiation Physics
- Ultrasound Physics
- MRI Physics
- Clinical applications of MRI
- Radiologic anatomy of the whole body
- Radiologic features of different diseases pertaining to various organs of the body
- Radiologic interventions
- Recent advances in Radiology

SYLLABUS FOR WRITTEN EXAM FOR THE POST OF
SUPERINTENDING ENGINEER (ENVIRONMENT) [POST CODE – (ENV 12)]

1. Engineering & Environmental Surveying
2. Environmental Chemistry & Microbiology
3. Geotechnical Engineering
4. Engineering Economics
5. Water Engineering: Design & Application, Wastewater treatment
6. Engineering Geology,
7. GIS & Remote Sensing
8. Waste Water Engineering:
9. Design and Applications
10. Instrumentation Techniques for Environmental Monitoring
11. Solid Waste Management
12. Air Pollution & Control
13. Hydrology & Ground Water Engineering
14. Vibration Analysis & Control of Noise Pollution
15. Industrial Waste Management including Hazardous waste, E waste, Bio medical waste
16. Climate Change & CDM
17. Soil contamination & remediation
18. Environmental Impact Assessment & Audit
19. System simulation & modelling
20. Environmental Law and Policy

SYLLABUS FOR WRITTEN EXAM FOR THE POST OF SUPERINTENDING MEDICAL OFFICER (ORTHOPEDIC SURGEON) [POST CODE – (MD 22)]

- Sports medicine and sports injury.
- Spinal injury assessment and management
- Upper limb and Lower limb – pathologies, assessment and management
- Musculoskeletal tumors
- Paediatric Orthopedics
- Recent advances
- ATLS

MEDICINE

1. Nutritional and Metabolic disorders
2. Water, Electrolyte and Acid-Base imbalance
3. Critical Care Medicine: Shock, Respiratory failure, Renal failure, Coma, Sepsis, DIC
4. Poisoning: Chemicals and Pesticides, Snake bite and envenomation, bites by scorpion/ spider
5. Specific Occupational and Environmental Hazards
6. Infectious Diseases
7. Cardiovascular System: Chest pain, Atrial Fibrillation, CCF, Rheumatic Heart Disease, Ischaemic Heart Disease, Hypertension , Atherosclerosis.
8. Respiratory Diseases: Cough, Dyspnoea, Haemoptysis, Respiratory Failure, RTI, Br. Asthma, COPD, Pulmonary Tuberculosis, Suppurative Lung Diseases
9. Occupational Lung Diseases
10. Nephrology: UTI, Haematuria, ARF, CRF, Glomerulonephritides
11. GIT: Diseases of the mouth, esophagus (Eg. GERD), stomach (Eg. Gastritis, PUD, Tumors) and duodenum, small intestine, colon and rectum
12. Pancreas: Acute and Chronic Pancreatitis
13. Liver and Biliary Tract disease: Jaundice, PHF, Portal HTN and ascites, Hepatic Encephalopathy, Hepatorenal failure, Liver abscess, Viral Hepatitis, Alcoholic Liver Disease
14. Endocrinology and Metabolism : Type 2 Diabetes mellitus, Thyroid Disorders
15. Haematology: Anaemias, Myeloproliferative Disorders, Blood products and transfusion , Haematological Malignancies
16. Disorders of Immune system, Connective Tissue and Joints: HIV, AIDS, Osteoarthritis, Sarcoidosis, Amyloidosis, Systematic Connective Tissue disorders like SLE, RA
17. Neurology: Headache, CVA, Seizure disorders, Meningitis, Viral Encephalitis, Peripheral Neuropathy, Parkinsons' Disease

SURGERY

1. SKIN: Ulcers and Wounds, Burns, Skin infections (Boils, Carbuncles, abscess), cysts, skin tumours
2. ESOPHAGUS: Dysphagia, reflux, Hiatus Hernia, Tumours
3. BREAST: Fibroadenoma, Breast abscess, Carcinoma breast
4. STOMACH AND DUDENUM: Peptic Ulcer, Carcinoms stomach, gastritis
5. SMALL INTESTINE: Small bowel obstruction, Intestinal Tuberculosis
6. Acute appendicitis
7. ANUS: Haemorrhoids, Fissure-in-ano, Anorectal abscess
8. Biliary tract: Gall stone Disease
9. Pancreas: Acute Pancreatitis
10. Acute abdomen
11. Hernia
12. Common urological disorders; Calculi, Hydrocoele, Epididymo-orchitis

OBSTETRICS AND GYNAECOLOGY

1. Physiology of pregnancy
2. Diagnosis of pregnancy
3. Routine antenatal care
4. Management of common symptoms of pregnancy
5. Hypertensive disorders of pregnancy
6. Anaemia of pregnancy
7. Ante partum haemorrhage
8. IUGR
9. Rh –ve pregnancy
10. Puerperium and its complications
11. Menstrual cycle and common menstrual disorders
12. Fibroid uterus
13. Precancerous lesions of the female genital tract
14. Carcinoma cervix, endometrium and ovary
15. Contraception
16. Menopause and related problems

PAEDIATRICS AND NEONATOLOGY

1. Care of the newborn
2. Neonatal resuscitation
3. Detection of neonatal malformations
4. Neonatal sepsis
5. Neonatal Hyperbilirubinaemia
6. Management of common neonatal problems
7. Immunization
8. Growth and Development
9. Nutrition

SYLLABUS FOR WRITTEN EXAM FOR THE POST OF
SENIOR OFFICER (ELECTRICAL) [POST CODE – (EE 15)]

Sl. No	Topic	Description
1	**Circuits And Networks**	Circuits and Networks, Two port network, Magnetically coupled circuit, Graph Theory, Application of Laplace Transform, Frequency Response, Fourier Analysis, Filter Circuits, Toport Network
2	**Electromagnetic Field Theory**	Vector Analysis, Electrostatics, Magnetostatics, Electromagnetic field, Materials and fields, Electromagnetic waves
3	**Analog Electronics**	Review of PN junction diode, Linear Wave Shaping, Bipolar Junction Transistor, MOSFET, BJT configuration, Multi-stage Transistor Amplifiers, Operational Amplifiers, Introduction to Feedback Amplifiers,
4	**Electrical Measurement And Measuring Instruments**	Introduction, Galvanometers and dynamics, Magnetic measurements, Bridges for measurements, Potentiometers, Measurement of power, power factor and energy,
5	**Power System-I**	Introduction to Power Plants, Economics of Power Systems, Transmission Systems, Distribution Systems, Line Constants, Mechanical Design, Underground Cables
6	**Signals And Systems**	Introduction to signals and systems, Introduction to system, Representation of signals, Statistical Signal Analysis,
7	**Electrical Machines-I**	Constructional features, Electric circuit, Insulation system, Cooling circuit, Supporting structure, Magneto-motive force, Electromotive Force, DC Generators, DC Motors, Transformer, Polyphase Induction Motor, Linear Induction Motors
8	**Digital Electronics**	Logic Families and Logic Gates, Number Systems and Codes, Sequential Logic Circuits, Combinational Logics, Semiconductor Memories, Introduction to ADCs
9	**Electrical Machines -II**	Synchronous Machines, Synchronous motors, Solid state slip power recovery schemes for induction motor, Single phase commutator motors, Single phase Induction Motors, Stepper Motor
10	**Control System - I**	Motivation, Models and physical systems, Time domain analysis, Root locus analysis, Frequency domain analysis, Controller/ Compensator Design, Compensator design
11	**Power System-II**	Performance of overhead transmission lines, Power system stability, Control of active and reactive power, Economic operation of steam Power plant, Elements of Hydrothermal co-ordination, Transients in power systems
12	**Microprocessor And Microcontroller**	Introduction, Microprocessor architecture, Programming microprocessors, Memory interfacing, Data transfer techniques and their implementation, Microcontrollers, Common peripherals and their interfacing, Important features of some advanced microprocessor, Applications of Microprocessors
13	**Control System-II**	Introduction to Digital Control, State Space Representation of Continuous Time and Discrete time systems, Introduction to nonlinear feedback control systems
14	**Power Electronics**	Introduction, Device characteristics, protection and operation, Phase controlled rectifiers, Choppers, Inverters, AC Voltage Controller, Cyclo converters, Applications

15	**Switchgear And Industrial Protection**	Symmetrical Fault Analysis, Symmetrical components and Unsymmetrical Fault Analysis, Neutral Grounding, Circuit Breakers, Protective Relays, Sub-Stations, Lightning Arrester
16	**Programming And Data Structure**	Introduction to Programming, Linear Data Structures, Recursion, Non-linear Data Structure, Hashing, Sorting and Searching Algorithms, File Structures
17	**Instrumentation**	Introduction, Analytical Instrumentation, Transducers & sensors, Non-destructive testing equipment, Data transmission & telemetry, Fiber optical instrumentation, Related topics
18	**Digital Signal Processing**	Discrete-Time Signals & Systems, Transforms, Sampling, Transform Analysis of LTI System, Structures for Discrete-time Systems, Filter Design Techniques, Discrete Fourier Transforms, Efficient Computation of DFT, Multi-rate signal processing, VLSI implementation, Applications of Signal Processing
19	**Industrial Drives**	Introduction, Dynamics of Electrical Drives, Selection of Motor Power Rating, Starting, Electric Braking, Control of Electrical Drives, Control of DC Drives, Control of Induction Motor Drives, Industrial Applications
20	**Analog & Digital Communications**	Introduction, Representation of signals and systems, Continuous Wave modulation, Random Variables and Stochastic Process, Sampling and Pulse modulation, Digital Communication, Introduction to Information Theory
21	**High Voltage AC/DC**	Breakdown mechanism of gases, Liquid and solid materials, Electrical properties of high vacuum, Over voltage phenomenon & Insulation co-ordination, High voltage generation, Measurement of High voltage & currents, High voltage Equipment, High voltage Testing and testing techniques, Design, planning and layout of high voltage laboratory, Introduction to EHV. System & EHV lines
22	**Flexible AC Transmission System**	Concepts of reactive power support and voltage stability, compensation at a bus and over a line. Synchronous condenser, static var compensation, static phase shifter, thyristor controlled switched capacitor, STATCONs and DVRs, Unified Power Flow Controller, Inter-line Power Flow Controller. Reactive power balance over a network and optimization.
23	**High Power Semiconductor Devices**	Power semiconductor devices, Converter operation, D.C. line commutation, Frequency conversion
24	**Higher Control System**	Optimal Control, Adaptive Control, Self-tuning control, Model Reference adaptive systems (MRAS), Real Time System Design, Fault Detection and Diagnosis of Dynamical System, Hardware Redundancy, Analytical Redundancy, Design of Detector, Electronic Instrumentation System Design,
25	**Electrical Engineering Materials**	Dielectrics, Behaviour of dielectrics in alternating fields, Magnetic Properties of materials, Conductors, Properties of Semiconductors, Conducting materials, Insulating materials.
26	**Smart Grid**	Basic Power Systems, Renewable Generation, Power System Economics, Smart Grid, Smart Grid Communications, Demand Side Management, Wide Area Measurement, Security and Privacy
27	**Industrial Management**	Industrial Engineering, Project management, Management, Organization, Material management, Production planning and control, Quality Control, Plant maintenance, Human Resource

		management
28	**Computer Applications In Power System**	Elementary linear graph theory, Different methods of solution of Linear and non-linear algebraic equations: Central Computer Control and Protection
29	**Intelligent Algorithms For Power Systems**	Introduction to Artificial Neural Networks (ANNs), multilayer feed-forward networks, back-propagation training algorithm, radial basis function and recurrent networks. ANN based algorithms for load flow analysis, economic load dispatch, load forecasting, transient stability, and power system stabilizers. Introduction to genetic algorithms, Application of genetic algorithms for power system optimization.
30	**Advanced Power Electronics And Devices**	Resonant DC – DC converters: operation, characteristics, design equations, control techniques and application; SMPS: Forward, fly back, push pull operation, characteristics, design and control techniques; Current controlled PWM; Voltage source inverters – Bang-bang, SPWM and space vector modulation techniques; Resonant DC link voltage source inverters – operation characteristics, design and control; Non drive applications of power electronic inverters: UPS, induction heating, metal cutting, active power line conditioning; Drive application of inverters: Vector controlled and slip power controlled induction motor drive, self-controlled synchronous motor drive – constant power factor and constant margin angle control; Permanent magnet synchronous motor drive, stepper motor drive and switched reluctance motor drive; Application of microprocessor, PC and DSP in machine drives – example with DC motor drive.
31	**Power Electronic Control Of AC Drives**	AC Machines for Drives, Control and Estimation of Induction Motor Drives, Vector or Field Oriented Control of Induction motor drives, Control and Estimation of synchronous motor drives, Brushless DC motor drives
32	**Advanced Engineering Mathematics**	Linear Algebra, Complex variable, Calculus, Vector Analysis, Linear Programming, Transform Calculus, PDE
33	**Integrated Circuits And VLSI Design**	MOS transistor (enhancement and depletion). Basic inverter in NMOS and CMOS technology, E/D logic. Gates in NMOS and CMOS technology. Pass transistor. Introduction to NMOS and CMOS design methodology. Design rules, stick diagrams, poly-cell and gate array approaches. Examples of cell design. Software tools for design. Circuit and logic simulation. Layout generation and verification.
34	**Restructured Electrical Power System**	Overview of key issues in electric utilities restructuring, Open Access Same Time Information System, Tagging Electricity Transactions, Electric energy trading, Hedging tools for managing risk in electricity markets
35	**Electric Power Utilisation And Traction**	Traction System, Power Supply System for Track Electrification, Power Supply Arrangement, Overhead Equipment, Traction Mechanics and its applications, Electric Heating, Illumination,
36	**Smart Sensors**	Smart sensors fundamentals, Smart sensors, Sensor networks architectures, Communication protocols, Energy management, Security, reliability and fault-tolerance, Sensor networks

		standards; platforms and tools
37	**Opto-Electronics And Fiber Optics**	Elements of Light And Solid State Physics, Display Devices and Lasers, Optical Detection Devices, Optoelectronic Modulator, Optoelectronic Integrated Circuits, Optical Fibers
38	**Renewable Energy Sources And Management**	Introduction, Solar Radiation, Low Temperature collectors, Applications of solar energy, Bioconversion, Wind energy, Other energy sources, Energy Management & Conservation
39	**Distribution System Planning And Automation**	Configuration of distribution systems, load characteristics, distribution transformers, distribution substation design, feeder design, voltage regulation, protection in distribution systems, SCADA, distribution automation.
40	**Demand Side Management**	The concepts of demand-side management (DSM) for electric utilities, DSM alternatives and goals. End-use equipment and control, utility equipment control, energy storage, dispersed generation, customer DSM promotions. Performance improvement equipment and system benefit/cost analysis of DSM alternatives: issues in forecasting DSM programme impacts. Implementation of DSM programme: pricing and incentives.
41	**Advance Electrical Machines**	Elements of Generalized Theory, Linear Transformation in Machines, D.C. Machines - Transient & Dynamic Performance, Transfer & Function, Poly-phase Synchronous Machines, Poly-phase Induction Machines, Fractional Kilowatt Motors
42	**Modelling And Simulation**	System Models and Role of Simulation, Statistical Tool, Discrete Event Simulation, Modelling and Performance Evaluation of Computer Systems, Continuous System Simulation, Virtual Reality Modelling, Verification and Validation of Simulation Models
43	**Illumination Technology**	Radiation, colour, eye & vision; Different entities of illuminating systems; Light sources; incandescent, electric discharge, fluorescent, arc lamps and lasers; Luminaries and light guides, control of light, control circuitry and computer based lighting control. Laws of illumination; illumination from point, line and surface sources. Photometry and spectrophotometry; Photocells. Environment and glare. General illumination design. Interior lighting-industrial, residential, office departmental stores, indoor stadium, theatre and hospitals. Exterior lighting - flood street, aviation and transport lighting, lighting for displays and signalling-neon signs, LED-LCD displays beacons and lighting for surveillance.
44	**Power Qualities**	Overview and definition of power quality PQ). Sources of pollution. International power quality standards, and regulations, Power quality problems: rapid voltage fluctuations, voltage unbalance, voltage and voltage swells, short duration outages. Power system harmonics: harmonic analysis, harmonic sources – static converters, transformer magnetization and non-linarites, rotating machines, arc furnaces, fluorescent lighting. Harmonic effects within the power system, interference with communication. Harmonic measurements. Harmonic elimination - harmonic filters.
45	**Reliability And**	Basic reliability model, Constant failure rate model, Time

	Maintainability Engineering	dependent failure models, Reliability of systems, State-Dependent Systems, Physical reliability models, Design of reliability, Maintainability, Design of Maintainability, Availability
46	**Foundation In Optimization Methods**	Introduction, Classical Optimization Techniques, Linear Programming, Non linear Programming, Constrained Optimization, Integer Programming. Non traditional Optimization Algorithm
47	**Biomedical Engineering**	Introduction to Biomedical Instrumentation, Cardio-vascular System and Electrocardiography, Biomedical recorders, Implantable Bio-electric devices, Patient Care and monitoring, Biotelemetry, Medical Imaging, Computers in Biomedical Instrumentation, Related topics
48	**Hydro-Electric Engineering**	Essential Features of Hydro-Electric Power Plant. Classification of Hydro-Electric Power Plants. Hydrology, Hydrologic Cycle, Hydrograph, Flow duration curve.
		Size of plant and choice of units. Types of Turbine and their characteristics. Design of Main Dimensions of turbines. Draft tubes, types, setting and preliminary dimensions.
		Pumped storage schemes. Mini and Micro Hydro Power Plants. Selection of turbine and pump capacities, Pumping schedule. Operation and efficiency of Pumped storage schemes.
		Cost evaluation of hydro-electric plant. Co-ordination of different types of Power Plant in power system. Economic loading of hydro-power plants. Hydro-thermal mix. Types of Underground Power Plants. Largest Underground Power Plant. Elementary idea of the use of computers in power stations. Load dispatching. Power system security. Load forecasting. Generation allocation control. Generation system reliability
49	**Soft Computing Techniques And Applications**.	Introduction to soft computing, intelligent decision system, overview of soft computing techniques. Introduction to genetic algorithm, genetic operators and parameters, genetic algorithms in problem solving, theoretical foundations of genetic algorithms, evolutionary programming, particle swarm optimization, differential evolution; implementation issues and applications. Neural model and network architectures, perceptron learning, supervised hebbian learning, backpropagation, associative learning, competitive networks, hopfield network, computing with neural nets and applications of neural network. case-based reasoning (CBR), applications of CBR. Introduction to fuzzy sets, operations on fuzzy sets, fuzzy relations, fuzzy measures, applications of fuzzy set theory to different branches of science and engineering.
50	**Database Management System**	Introduction, Entity-Relationship Model, Relational Model, SQL and Integrity Constraints, Relational Database Design, Internals of RDBMS, File Organization & Index Structures
51	**EHV Transmission**	Introduction to EHV AC Transmission, Calculation of line & Ground parameters, Voltage gradient of conductors, Corona

		Effect – 1, Corona effect - 2 (Radio interference), Electrostatic field of EHV lines, DC Power Transmission Technology, Thyristor Valves, Analysis of HVDC converters, Converter & HVDC System Control
52	**Computer Organisation And Architecture**	Introduction, Processor Design, Controller Design, Memory Organization, Input – Output Processing, Peripheral System, Introduction to Operating System
53	**Intelligent And Knowledge Based Systems**	Problem solving: state space representation, problem reduction, constraint satisfaction networks. Heuristics. Knowledge Representation, Predicate calculus, resolution-refutation, Prolog. Rule based systems: forward and backward chaining. Handling of uncertainty: probabilistic techniques, fuzzy logic. Reasoning with incomplete information: non-monotonic reasoning. Elements of temporal logic. Diagnostic reasoning. Structured Knowledge Representation Schemes: Semantic networks, Frames, Inheritance and default reasoning. Expert Systems: Architecture of the expert systems. Expert system shells. Knowledge acquisition. Consistency of the knowledge base. Case studies. Distributed AI and agent based systems.
54	**Renewable Energy**	Introduction to Non-conventional energy sources, Solar Energy, Photovoltaic Energy Conversion, Wind Energy, Fuel Cell, Energy from bio-mass, Geo thermal Energy, Energy from the ocean, Magneto Hydro Dynamic Generation ,Combined Operation utilizing more than one source, composite systems
55	**Utilization & Conservation of Electrical Energy**	Electric Heating, Electric Welding, Electric traction, Energy Storage, Electrical Losses & Energy Conversion
56	**Digital Image Processing**	Human Visual System and Image perception, Image Transforms, Image enhancement, Spatial filtering, Image Restoration, Image Compression, Image Segmentation, Representation and Description, Applications of Digital Image Processing
57	**Reliability Engineering**	Introduction to Reliability Engineering, Reliability Mathematics, Concepts of Reliability, System Reliability Evaluation, Availability Analysis, Maintained Systems, Economics of Reliability Engineering

SYLLABUS FOR WRITTEN EXAM FOR THE POST OF
SENIOR OFFICER (ELECTRONICS & COMMUNICATION) [POST CODE – (E&C 16)]

1. BASIC ELECTRICAL ENGINEERING

- DC circuits-Ohm's & Kirchoff's laws, mesh and nodal analysis, circuit theorems
- Electro-magnetism, Faraday's & Lenz's laws, induced EMF and its uses
- Single-phase AC circuits
- Transformers, efficiency
- Basics- DC machines, induction machines, and synchronous machines
- Electrical power sources- basics: hydroelectric, thermal, nuclear, wind, solar
- Basics of batteries and their uses

2. ELECTRONIC DEVICES

- Energy bands in intrinsic and extrinsic silicon
- Carrier transport: diffusion current, drift current, mobility and resistivity
- Generation and recombination of carriers; Poisson and continuity equations
- P-N junction
- Basics of semiconductors; Diode/Transistor basics and characteristics
- Diodes for different uses and characteristics
- Junction & Field Effect Transistors (BJTs, JFETs, MOSFETs);
- Power Switching Devices such as SCRs
- Integrated circuit fabrication process: oxidation, diffusion, ion implantation,
- photolithography and twin-tub CMOS process
- Basics of Integrated Circuits (ICs)
- Bipolar, MOS and CMOS ICs;
- Basics of linear ICs
- Optical sources/detectors; Basics of Optoelectronics and its applications.

3. NETWORK THEORY

- Network Analysis Techniques: Nodal and Mesh analysis
- Network Theorems: superposition, Thevenin and Norton's, maximum power transfer
- Transient Response
- Wye-Delta transformation;
- Steady State Sinusoidal Response using phasors
- Linear constant coefficient differential equations- Time domain analysis of RLC circuits
- Solution of network equations using Laplace transform
- Frequency domain analysis of RLC circuits
- Network Graphs and their Applications in network analysis
- Tellegen's theorem
- Two port networks; Z, Y, h and Transmission parameters
- Driving point & transfer functions
- Combination of two ports, analysis of common Two ports
- State equations for networks

4. ANALOG CIRCUITS

- Small signal equivalent circuits of diodes, BJTs and MOSFETs;
- Simple diode circuits: clipping, clamping and rectifiers etc.
- Single-stage BJT and MOSFET amplifiers: biasing, bias stability, mid-frequency small signal analysis and frequency response
- BJT and MOSFET amplifiers: multi-stage, differential, feedback, power and
- operational.
- Simple op-amp circuits
- Active filters
- Sinusoidal oscillators: criterion for oscillation, single-transistor and opamp configurations
- Function generators, wave-shaping circuits and 555 timers
- Voltage reference circuits
- Power supplies: ripple removal and regulation.

5. DIGITAL CIRCUITS

- Number systems
- Transistor as a Switching element
- Boolean Algebra
- Simplification of Boolean Function: Karnaugh map and Applications
- IC Logic Gates and their Characteristics
- IC Logic Families: DTL, TTL, ECL, NMOS, PMOS and CMOS gates and their comparison
- Combinational Logic Circuits: Half Adder, Full Adder, Digital comparator, Code converter, Multiplexer, De-multiplexer etc.
- ROM and Their Applications
- Latches and Flip-Flops: R-S, J-K (Master Slave), D and T flip-flops
- Different Types of Counters and Registers
- Waveform Generators
- A/D and D/A Converters
- Semi-conductor Memories
- 8-bit microprocessor (8085): architecture, programming, memory and I/O interfacing.

6. SIGNALS AND SYSTEMS

- Definitions and Classifications of different types of Signals and Systems;
- Some special signals of importance: unit step, unit impulse, sinusoid, complex
- exponential.
- Signal properties: periodicity, absolute integrability, determinism and stochastic
- character.
- Signal operations: scaling, shifting, inversion, etc.
- System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability
- Random Signals and Probability
- Correlation Functions
- Power Spectral Density
- Response of Linear system to random inputs
- System Modelling in terms of differential and difference equations

- State Variable Representation
- Continuous-time signals: Fourier series and Fourier transform representations their application to system analysis
- Laplace Transforms and their application to system analysis
- Convolution and superposition integrals and their applications
- Sampling theorem and applications: Shannon Theorem, Nyquist Criteria
- Discrete-time signals: interpolation of discrete-time signals , discrete-time Fourier transform (DTFT), DFT, FFT, Z-Transforms and their applications to the analysis and characterization of discrete time systems
- LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay, digital filter design techniques.

7. COMMUNICATION SYSTEMS

- Random signals, noise, probability theory, information theory
- Autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems
- Modulation and Detection in Analogue: Systems- AM, FM, PM, transmitters/receivers, theory/practice/ standards, SNR comparison
- Digital communication basics: Sampling, quantizing, coding, PCM, DPCM, multiplexing-audio/video
- Time Division and Frequency Division Multiplexing, TDMA, FDMA, CDMA.
- Digital modulation: ASK, FSK, PSK, QAM
- SNR and BER for digital modulation
- Fundamentals of error correction, Hamming codes
- Equalization
- Timing and frequency synchronization, inter-symbol interference and its mitigation
- Optical Communication: In Free space and Fibre optics.
- Propagation of signals at HF, VHF, UHF and microwave frequency
- Satellite Communication

8. CONTROL SYSTEMS

- Control Systems: Basic control system components
- Feedback systems-open & close loop types , effect of Feedback on Stability and
- sensitivity
- Transfer function
- Block diagram representation
- Signal flow graph
- Transient and steady-state analysis of LTI systems
- Frequency response
- Routh-Hurwitz and Nyquist stability criteria
- Bode and root-locus plots
- Lag, lead and lag-lead compensation
- State variable model and solution of state equation of LTI systems
- Design of control systems, compensators, elements of lead/lag compensation, PID and industrial controllers.

9. ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

- Principles of measurement, accuracy, precision and standards
- Analog and Digital systems for measurement, measuring instruments for different applications
- Static/dynamic characteristics of measurement systems, errors, statistical analysis and curve fitting
- Measurement systems for non-electrical quantities
- Basics of telemetry
- Different types of transducers and displays
- Data acquisition system basics.

10. COMPUTER ARCHITECTURE, DATA COMMUNICATION AND NETWORKING

- Basic architecture, CPU, I/O organisation, memory organisation, peripheral devices
- Hardware /software issues
- Operating systems-basics, processes, characteristics, applications
- Memory management, virtual memory, file systems, protection & security
- Data bases, different types, characteristics and design
- Elements of programming languages, typical examples
- Overview of data communication and Networking: Data communications components, data representation (ASCII, ISO etc.), direction of data flow (simplex, half duplex, full duplex), networks: distributed processing, network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN, WAN).
- Internet: brief history, internet today, protocols and standards, reference models
- OSI reference model, TCP/IP reference model, their comparative study
- Basic packet multiplexed streams/scheduling
- Cellular networks, types, analysis.

11. ADVANCED ELECTRONICS TOPICS

- DSP: Discrete time signals/systems, uses
- Digital filters: FIR/IIR types, design, speech/audio/radar signal processing uses
- Transmission lines: Circuit model for transmission lines, loss less and lossy lines, field analysis of transmission lines, Smith chart, impedance matching.
- Microprocessors & microcontrollers, basics, interrupts, DMA, instruction sets, interfacing
- Controllers & uses
- Embedded systems.

SYLLABUS FOR WRITTEN EXAM FOR THE POST OF
SENIOR OFFICER (LAND/LEGAL) [POST CODE – (LL 17)]

Sl No.	Subjects
1	Constitution Of India
2	Indian Penal Code, 1860
3	Labour And Industrial Laws
4	Land Laws of the State of Assam
5	The Arbitration and Conciliation Act, 1996
6	The Code of Civil Procedure, 1908
7	The Code of Criminal Procedure, 1973
8	The Companies Act, 2013
9	The Indian Contract Act, 1872
10	The Indian Evidence Act, 1872
11	The Indian Partnership Act, 1932
12	Environmental Laws
13	The Right to Information Act, 2005
14	Transfer to Property Act, 1882

SYLLABUS FOR WRITTEN EXAM FOR THE POST OF SENIOR OFFICER (MECHANICAL) [POST CODE – (ME 18)]

- **Theory of Machines**:
  Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains; flywheels and governors; balancing of reciprocating and rotating masses; gyroscope'.

- **Machine Design**:
  Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements such as bolted' riveted and welded joints; shafts, gears, rolling and sliding contact bearings' brakes and clutches' springs.

- **Vibrations**:
  Free and forced vibration of single degree of freedom systems' effect of damping; vibration isolation; resonance; critical speeds of shafts'.

- **Engineering Mechanics**:
  Free-body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion; impulse and momentum (linear and angular) and energy formulations, collisions.

  Mechanics of Materials: Stress and strain, elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain, thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts; Eule/s theory of columns; energy methods; thermal stressesi strain gauges and rosettes; testing of materials with universal testing machine; testing of hardness and impact strength.

- **Engineering Materials**:
  Structure and properties of engineering materials, phase diagrams,heat treatment, stress-strain diagrams for engineering materials.

  Casting, Forming and Joining Processes: Different types of castings, design of patterns, moulds and cores; solidification and cooling; riser and gating design. Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy. Prlnciples of welding, brazing,soldering and adhesive bonding.

- **Machining and Machine Tool Operations**:
  Mechanics of machining; basic machine tools; single and multipoint cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, design of jigs and fixtures.

- **Metrology and Inspection**:
  Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.
- **Production Planning and Control**: production planning, scheduling, materials requirement planning.

- **Fluid Mechanics**: Fluid properties; fluid statics, manometry, buoyancy, forces on submerged bodies, stability of floating bodies; control-volume analysis of mass' momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli'sequation; dimensional analysis; viscous flow of incompressiblefluids, boundary layer, elementary turbulent flow, flow through pipes' head losses in pipes, bends and fittings, Different types of pumps.

- **Thermodynamics:** Thermodynamic systems and processes; properties of pure substances,
  behavior of ideal and real gases zeroth law, and first laws of thermodynamics' calculation of
  work and heat in various processes; second law of thermodynamics; thermodynamic property charts and tables, availability and irreversibility; thermodynamic relations'.

- **Power Engineering**: Air and gas compressors; vapour and gas power cycles, concepts of regeneration and reheat and I.C Engines: Air-standard Otto' Diesel and dual cycle, refrigeration and air conditioning: Vapour and gas refrigeration and heat pump properties of moist air, basic psychrometric processes'

- **Turbo machinery:** lmpulse and reaction principles' velocity diagrams' Pelton-wheel' Francis and Kaplan turbines.

Part A: Basic Geology (25% weightage)

Earth and Planetary system - size, shape, internal structure and composition of the earth; concept of isostasy; continental drift; plate tectonics – relationship with earthquakes, volcanism and mountain building; continental and oceanic crust – composition, structure and thickness. Weathering and soil formation; landforms created by river, wind, glacier, ocean and volcanoes. Basic structural geology - stress, strain and material response; brittle and ductile deformation; nomenclature and classification of folds and faults. Mechanism of rock deformation; primary and secondary structures; geometry and genesis of folds, faults, joints and unconformities. Petrology – mineralogy and classification of common igneous, sedimentary and metamorphic rocks, concept of porosity and permeability. Geological time scale - geochronology and absolute time. Principles of Stratigraphy and concepts of correlation. Stratigraphic principles; major stratigraphic divisions of India. Sedimentary Basins in India and their types, Geological and geographical distribution of petroleum resources of India. Petroleum Geology and Petroleum system- source rocks, reservoir rocks, reservoir traps, migration paths, seals.

Part B: Geophysics (75% weightage)

The earth as a planet; different motions of the earth; gravity field of the earth; geomagnetic field, paleo-magnetism; Geothermics and heat flow, elements of seismology – body and surface waves, propagation of body waves in the earth's interior; variation of density, velocity, pressure, temperature, electrical and magnetic properties of the earth; earthquakes-causes and measurements, magnitude and intensity, focal mechanisms & beach ball diagrams, earthquake quantification, source characteristics, seismo-tectonics and seismic hazards; digital seismographs. Scalar and vector potential fields; Laplace, Maxwell and Helmholtz equations for solution of different types of boundary value problems in Cartesian, cylindrical and spherical polar coordinates; Green's theorem; Image theory; integral equations in potential theory; Eikonal equation and Ray theory.

Absolute and relative gravity measurements; Gravimeters, Land, airborne, shipborne and bore-hole gravity surveys; various corrections for gravity data reduction – free air, Bouguer and isostatic anomalies; density estimates of rocks; regional and residual gravity separation; principle of equivalent stratum; data enhancement techniques, upward and downward continuation; derivative maps, wavelength filtering; preparation and analysis of gravity maps; gravity anomalies and their interpretation – anomalies due to geometrical and irregular shaped bodies, depth rules, calculation of mass.

Elements of Earth's magnetic field, units of measurement, magnetic susceptibility of rocks and measurements, magnetometers, Land, airborne and marine magnetic surveys, Various corrections applied to magnetic data, IGRF, Reduction to Pole transformation, Poisson's relation of gravity and magnetic potential field, preparation of magnetic maps, upward and downward continuation, magnetic anomalies- geometrical shaped bodies, depth estimates, Image processing concepts in processing of magnetic anomaly maps; Interpretation of processed magnetic anomaly data. Applications of gravity and magnetic methods for oil exploration.

Conduction of electricity through rocks, electrical conductivities of metals, non-metals, rock forming minerals and different rocks, concepts of D.C. resistivity measurement, various electrode configurations for resistivity sounding and profiling,
application of filter theory, Type-curves over multi-layered structures, Dar-Zarrouck parameters, reduction of layers, coefficient of anisotropy, interpretation of resistivity field data, equivalence and suppression, self-potential and its origin, field measurement, Induced polarization, time and frequency domain IP measurements; interpretation and applications of IP, ground-water exploration, mineral exploration, environmental and engineering applications.

Basic concept of EM induction in the earth, Skin-depth, elliptic polarization, in phase and quadrature components, Various EM methods, measurements in different source-receiver configurations. Earth's natural electromagnetic field, tellurics, magneto-tellurics; geomagnetic depth sounding principles, electromagnetic profiling, Time domain EM method, EM scale modeling, processing of EM data and interpretation. Geological applications in hydrocarbon exploration.

Seismic methods of prospecting- Elastic properties of earth materials; Reflection, refraction and CDP surveys; land and marine seismic sources, generation and propagation of elastic waves, velocity – depth models, geophones, hydrophones, recording instruments, digital formats, field layouts, seismic noises and noise profile analysis, optimum geophone grouping, noise cancellation by shot and geophone arrays, 2D and 3D seismic data acquisition, processing and interpretation; CDP stacking charts, binning, filtering, dip-moveout, static and dynamic corrections, Digital seismic data processing, seismic deconvolution and migration methods, attribute analysis, bright and dim spots, seismic stratigraphy, high resolution seismic, VSP, AVO. Basic Reservoir geophysics.

Geophysical signal processing, sampling theorem, aliasing, Nyquist frequency, Fourier series, periodic waveform, Fourier and Hilbert transform, Z-transform and wavelet transform; power spectrum, delta function, auto correlation, cross correlation, convolution, deconvolution, principles of digital filters, windows, poles and zeros.

Principles and techniques of geophysical well-logging, SP, resistivity, induction, gamma ray, neutron, density, sonic, temperature, dip meter, calliper, nuclear magnetic, cement bond logging, micro-logs. Quantitative evaluation of formations from well logs; application of borehole geophysics in oil exploration.

Radioactive methods of prospecting and assaying of mineral (radioactive and non- radioactive) deposits, half-life, decay constant, radioactive equilibrium, G M counter, scintillation detector.

Basic concepts of forward and inverse problems, ill-posed of inverse problems, condition number, non-uniqueness and stability of solutions; L1, L2 and Lp norms, overdetermined, underdetermined and mixed determined inverse problems, quasi- linear and non-linear methods including Tikhonov's regularization method, Singular Value Decomposition (SVD), Non-linear inverse problems, Gauss Newton method,, steepest descent (gradient) method, Backus-Gilbert method, simulated annealing, genetic algorithms and artificial neural network.

Basic principles of remote sensing – energy sources and radiation principles, atmospheric absorption, interaction of energy with earth's surface, aerial-photo interpretation, multispectral remote sensing in visible, infrared, thermal IR and microwave regions, digital processing of satellite images. GIS – basic concepts, raster and vector mode operations.

1. MEASUREMENT

a) Basic measurement concept — Accuracy, linearity, repeatability, hysteresis, dead band, backlash, error.

b) Classification of Transducers: Resistive, Capacitive, Inductive transducers, Hall Effect sensors, magneto elastic transducers, solid state sensors, eddy current transducers, PiezoElectric transducers, photo electric transducers.

c) Applications of Diaphragms, Bellows, Bourdon Tubes, Springs

d) Semiconductor sensors, sources and detectors, LED, laser, Photo-diode, photo-resistor and their characteristics, load cells, LVDT, gas sensors, density, viscosity, moisture and humidity measurements

e) Electrical and Electronics Measurements: Bridges and potentiometers, measurement of R, L and C. Measurements of voltage, current, power, power factor and energy. A.C & D.C current probes. Extension of instrument ranges. Q-meter and waveform analyzer. Serial and parallel communication. Shielding and grounding.

2. INDUSTRIAL INSTRUMENTS

a) Temperature measurement: Thermocouple, Resistance Temperature Detector, Thermistor and its measuring circuits, Radiation pyrometers and thermal imaging.

b) Pressure measurement: Transmitter definition types, Mechanical, Electro-mechanical and electronic pressure measuring instruments. Manometers, Elastic types, Bell gauges, Bellows; Bourdon tubes; Vacuum measurement. Differential Pressure transmitters, Dead weight Pressure gauges. Low Pressure Measurement.

c) I/P and P/1 Converters

d) Level measurement: Differential pressure level detectors, Displacement type Level Detectors, Capacitance level sensor, Ultrasonic level detectors and Radar level transmitters and gauges.

e) Flow measurement: Classification of flow meters, Head Type (Orifice), differential pressure and variable area flow meters, anemometers, Positive displacement flow meters, Electro Magnetic flow meters, Ultrasonic flow meters, vortex flow meters.

f) Measurement of mass flowrate - Radiation, angular momentum, impeller, turbine, constant torque hysteresis clutch, twin turbine, Coriolis, gyroscopic. Target flowmeters, V-cone flowmeters, Multiphase flow measurement

g) Pneumatic Instrumentation - Air filter, Pressure regulator, Servo valve, Relay, Amplifier, Controller

h) Recorders: Different types of recorders; Construction, working principle and circuit diagrams of Strip-chart & X-Y recorders

i) Miscellaneous measurement: Ammeter, Voltmeter, Digital Multimeter, Ohmmeter, Cathode Ray Oscilloscope, Vibration meters, pH meters, Dew Point Meters, Viscosity,Humidity & Density.

j) Different chromatography techniques — Gas chromatography — Detectors — Liquid chromatographs — Applications

k) Calibration of Instruments

l) Concept of live zero (4-20 mA and 3-15 psi)

3. CONTROL SYSTEM AND PROCESS CONTROL
a) Process & process control systems; Objectives & requirements; Classification & selection of process variables; Sources &nature of disturbances; Response of first and second order systems due to load change at arbitrary points with P, l, P-1 and P-I-D controllers

b) On-off, cascade, P, l, P-l, P-ID, feed forward and derivative controller, Fuzzy controllers

c) Multi loop control systems: Cascade control, override control, split-range control, feedforward control and ratio control systems.

d) Controller tuning- Process reaction curve method, Ziegler Nichols method, Damped oscillation method, Two-point method, Multiloop Control-Feed forward, Ratio, Cascade, Inferential, Split range control, Internal Model Controller, Dead time Compensator.

e) Feedback principles. Signal flow graphs. Transient Response, steady-state-errors. Routh and Nyquist criteria. Bode plot, root loci. Time delay systems. Phase and gain margin. State space representation of systems.

f) Mechanical, hydraulic and pneumatic system components.

g) Control valve: Construction and working principle, valve sizing, valve plug, valve characteristics, valve positioners.

4. ANALOG ELECTRONICS

a) Characteristics of diode, BJT, JFET and MOSFET.

b) Diode circuits. Transistors at low and high frequencies, Amplifiers, single and multi-stage. Feedback amplifiers.

c) Rectifier Circuits: Single-phase half wave, 2-phase half wave, Single-phase bridge uncontrolled, fully control & half-controlled rectifiers; Transformer rating; Rectification with R-L & R-C loads; Power factor improvement.

d) Operational amplifiers, characteristics and circuit configurations. Instrumentation amplifier. Precision rectifier. V-to-l and I-to-V converter. Op-Amp based active filters. Oscillators and signal generators.

5. DIGITAL ELECTRONICS
a) Combinational logic circuits, minimization of Boolean functions. IC families, TTL, MOS and CMOS.
b) Boolean Algebra & Logic Functions; Boolean algebra; Boolean expressions; Truth table representation, AND, OR, NOT, NAND, NOR, XOR & XNOR gates and their truth tables;
   Implementation of Boolean functions using logic gates
c) Arithmetic circuits. Comparators, Sequential circuits, flip-flops, counters, shift registers.
   Multiplexer. Analog-to-Digital and Digital-to-Analog converters.
d) Basics of number system. General definitions of mini computers, microprocessors, micro controllers and digital signal processors, Microprocessor applications, memory and inputoutput interfacing. Microcontrollers.
e) Performance metrics of logic families, Binary codes, Multiplexers, De-multiplexers, Encoders, Decoders, Comparators, Parity generators and checker. Latches, flip-flops,
   Synchronous and Asynchronous circuits - Counters, Shift registers.

6. POWER SYSTEMS
a) Principle of operation of inverter; voltage driven inverter; current driven inverter.
b) A.C Voltage controller, ON-OFF control; Phase angle control; Single phase bi-directional controller.
c) Power supplies: D.C. power supply; Switching Mode Power Supply (SMPS), Bi-directional power supplies; A.C. power supplies; Uninterrupted Power Supply (UPS), Power factor conditioning.
d) Instrument Transformers: Uses of instrument transformers; Theory and Testing of Current Transformers & Potential Transformers.
e) Semiconductor power devices: Characteristics of power devices- Diode, Power transistor, Thyristor and TRIAC; Firing circuit for Thyristor & TRIAC; Rating, Cooling & mounting of Thyristor; Series & parallel connection of Thyristor; Protection of Thyristor; Gate trigger & commutation circuits; Gate Turn-Off Thyristor (GTO); power MOSFET; IJJT; DIAC & IGBT.

7. DATA TRANSMISSION AND COMMUNICATION
a) Communication engineering: Electromagnetic radiation, Need for modulation- AM, FM,
b) Noise in electronic circuits; capacitive & inductive coupling; shielding; co-axial & twisted pair cable; grounding.
c) Instrumentation Standard Protocols: HART Protocol structure and programming, Advantages and Limitations. Foundation Fieldbus structure, programming, Benefits, Advantages and Limitations, other fieldbus standards including Device Net, Profibus,
   ControlNet, CAN, Industrial Ethernet etc.
d) Wireless Communication protocols and Standards

8. INDUSTRIAL ADVANCED PROCESS CONTROL

a) Programmable logic controllers (PLC): Architecture, Discrete state process control, relay diagram, ladder diagram, ladder diagram examples, relay sequencers, timers/counters, PLC design, Study of industrial PLC. PLC Installation, troubleshooting and maintenance.
   Design of alarm and interlocks, networking of PLC.

b) Distributed Control Systems: Functions, advantages and limitations, DCS Architecture, specifications, configuration and programming, functions including database management, reporting, alarm management, communication, third party interface, control, display etc. Enhanced functions viz. Advance Process Control, Batch application,
   Historical Data Management, OPC support, Security and Access Control etc.

c) Interfacing Smart field devices (wired and wireless) with PLC and DCS.

d) SCADA architecture and uses, PLC interface to SCADA/DCS using communication links
   (RS232, RS485) and protocols (Modbus ASCII/RTU).

e) Principles & working of Gas turbine plants; Safety aspect in Power Plants.

f) Control for—boiler, condenser, steam heater, pumps, compressor, generator cooling system.

g) Turbine supervisory system for monitoring of Mechanical parameters--- speed, vibration, eccentricity etc; Turbine trip condition

9. INDUSTRIAL STANDARDS, SAFETY AND PROJECTS

a) Design: Functional requirements & specifications; NEMA, DIN, BSI, ANSI standards; Guidelines of enclosure design, cable design. Standards used in instrumentation project:
   ISA S5.1, S5.3, S5.4, S5.5 and £.20, ANSI, & NFPA.

b) Selection and Application: Selection and application of temperature, pressure, flow and level measuring instruments.

c) Standards and Calibration: Calibration of temperature, pressure and flow measuring devices. Introduction to ISO, IEC and API standards pertaining to temperature, pressure and flow instrumentation.

d) EMI and EMC: Interference coupling mechanism, basics of circuit layout and grounding, concepts of interfaces, filtering and shielding.

e) Safety: Introduction, electrical hazards, hazardous areas and classification, nonhazardous areas, enclosures-NEMA types, fuses and circuit breakers. Protection methods: Purging, explosion proofing and intrinsic safety. ESD protection in equipment and Plants.

f) Specifications: Specification of instruments, preparation of project documentation, process flow sheet, instrument index sheet, instrument specifications sheet, panel drawing and specifications, instrument specifications.

g) Definition of project purpose—scope, time, quality, organizational structure; Basic & detailed engineering; Project S curves; Types of projects & Types of contracts. Project procedure, schedules, vendor drawing, tender documentation, selection of measurement method and control panels.

h) Program evaluation and review techniques (PERT) and Critical path method (CPM), Scurve concept and crash time concepts, software used in project management; software features, classification, evaluation and implementation.

SYLLABUS FOR WRITTEN EXAM FOR THE POST OF
CONFIDENTIAL SECRETARY [POST CODE – (CS 21)]

TYPEWRITING ENGLISH:

1) Importance of typewriting in modern era. Typewriting for vocational use, personal use and college preparatory.

2) Various kinds of typewriters based on the make, the type, the size, the language etc. Manual typewriter, electric typewriter, electronic typewriter, world processor.

3) Systems of typing, touch system and sight system, their advantages and disadvantages, arranging the materials for typing and end of the class procedure. Correct typing procedure, operative various parts of a typewriter and their use.

4) Manipulative control, margin steps, paper guide, paper release, line space guage, cylinder knobs, shift key, space bar etc. Insertion and removal of paper in/out of machine. Covering the key-board typing of alphabats words, phrases, sentences and small paragraphs. Typing of number and symbol keys. Typing of symbols not given on the key board.

5) Centering, horizontal and vertical mathematical and judgement placement. Proof reading and correcting of error, proof correction marks, use of different types of erasing materials, erasers (rubber, pencial) chemical tape, chemical liquid, correction tape within the machine squeezing and superseding. Key board operation : Need for proper type and size of tables and chairs for use of typist, sitting postures materials required.

6) Typing of letters, blocked, semi blocked and NOMA simplified with open closed and mixed punctuations. Typing of short letters (small and/or full size letter papers) one page letter and letter running into more than one page.

7) Typing of addresses on envelopes, inland and postcards including window display chain feed. Typing of annexure and appendices to letters.

8) Tabular typing, two columns table and multiple column table box, etc. display of tabulation work. Typing of financial and costing statements, use of carbon paper for taking out more than one copy. Methods using carbon, machine assembly method and desk assembly method.

9) Correction of errors on the carbon copies (paper being in the machine and taken out of the machine).

10) Stencil cutting : Its insertion in the machine change of ribbon setter or removal of ribbon. Placement of subject matter, use of different materials like, styles scales, slate, signature pad etc.

11) Typing on printed forms like invoices, bills, quotations, tenders index cards, telegrams, etc. Composing at the typewriter (using typewriting as a writing tool, drafting the subject matter at the typewriter directly. Typing from recorded tapes.

12) Production typing, typing of simple and confused manuscripts. Typing of orders, circulars, notices, memoranda, notes, advertisements, interview letters, appointment letters etc. Typing of bibliography, Typing of graph papers.

13) Care and maintenance of the typewriter. Oiling and cleaning of the machine. Change of ribbon, Minor repair work.

14) Calculation of speed, straight copy typing (GWAM, CWAM and NWAM) and production typing (G-PRAM and N-PRAM) and MWAM. Speed competition, Indian and world records in typing.

15) Personal habits and work habits, personal appearance, willingness, promptness, initiative, trustworthiness, punctuality, etc. Following instructions/directions.

SHORTHAND ENGLISH:

1) The consonants, the vowels, intervening vowels and position, grammalogues, punctuation, alternative signs for `r' and `h'.

2) Dipthongs abbreviated `W' and phraseography incuding tick The.

3) Representing `S' and `Z' with circle and strokes, large circles `sw' and `ss' or `sz'.

4) Loops `ST' and `STR' initial hooks to straight strokes and curves, `N' and `F' hooks, alternative forms for `fr' and `vr' etc. with intervening vowels.

5) Circle and loops to final hooks, the shun hooks.

6) The aspirate, upward and downward `r', `l' and `sh' compound consonants vowel indication.

7) The halving principle, the doubling principle, dipthonic or two vowel signs, medial semi circle.

8) Prefixes, suffixes and terminations and negative words. UNIT – 4 Note taking, transcription etc., shorthand in practice. Transcription in long hand on the typewriter also.

9) Contraction, special contractions, proper names etc., essential vowels, intersections, advanced phraseography.

10) Business phrases, insurance, banking, railway, stock booking and shipping phrases etc.

11) Technical, theological, political phrases, phrases used in other walks of life, special words.

12) Office like dictation direct or through recorded devices like tape recorders, dictation machines radio, TV etc. of official, business and personal.

13) Correspondence, noting, précis, confidential matters, filling of various kinds of proformas used in organizations and institutions.

14) Transcription on the typewriter of the seen and unseen materials related to the work of a steno-typist in various organizations/outlines for the names of some chief cities and towns. Grammalogues arranged alphabetically grammalogues arranged phonetically Special list of contractions.

OFFICE MANAGEMENT

1) Office Accommodation and Environment - Office building : size, layout, safety and security measures - Reception : Importance, shape and size, control - Communication : Feature, classification, barriers. - Arrangement and adjustment : Furniture, allotment of seats, chambers, cabins rooms etc. - Handling of correspondence and market registers, filling forms and stationery.

2) Office Machines, manuals, charts and reports - Kind of office machines (typewriter, duplicating computers and word processors), calculators, etc. - Objectives and advantages of various machines. - Use of machines, installing, handling, maintenance. - Objectives and advantages of office manuals charts,

preparation and play of manuals and charts. - Kind of reports, report preparation, enquiries.

3) Personnel Management, Supervision, Control and coordination. - Office staff (Peon, daftari, clerk, technical staff, supervisors, accountant, manager, etc.) Selection, training and development. - Supervision : Importance and span of supervision - Discipline : Importance and manner of office control, work control and work distribution.

SECRETARIAL PRACTICE:

1) Company : Definition, nature and kinds, Company formation and incorporation, promoter, capital subscription, company and association, memorandum and articles, prospectus and statements, meetings and Company Act.

2) Secretary : Definition, need and importance, appointment and dismissal, work, duties, rights and liabilities, memorandum of association and secretary, articles of association and secretary, prospectus and secretary.

3) Company management and administration : Definition, importance and kinds, directors : qualification and number, appointment, removal, powers, duties and liabilities, remuneration, prevention of oppression and mismanagement, compromise, arrangement, reconstruction and amalgamation, winding up and dissolution of companies, jurisdiction, consequences, petition, liquidator.

4) Share and debentures, application, allotment, transfer and transmission, calls and forfeiture, dividend and interest, account and audit, taxes.

COMMERCIAL CORRESPONDENCE:

1) Correspondence : Commercial, officials, demi official, meaning, importance, objectives, sales letter, trade order agency correspondence, import, export trade, secretarial correspondence, application for jobs, post of accountant, lecturer, office memorandum, reminder, difference between official letter and demi official letter, correspondence between head of department and principal for asking honorarium and for admission notice, correspondence between principal and university for sending enrollment numbers and for the permission for extra admission, correspondence between principal and UGC for asking grant for vocational subject and for recognition of a new subject.

2) Writing Hindi : Introduction to typewriter, origin and development, importance, utility, classification, standard, manual, portable, noiseless, vary typer, electronic, Key board operation, method of typing, sight and touch methods, key board skills, division of keys between fingers, varical horizontal approach, typing rhythm, backing sheet etc., knowledge of proof correction signs, carbon manifolding and duplicating, stenciling, cyclostyling, photocopying machines etc.

COMPUTER IN COMMUNICATION:

Concept and Importance of Computer in Communication. General Idea of various operating systems, Introduction to Number system, Introduction to internet, office package.