SYLLABUS FOR DIRECT RECRUITMENT TO THE POSTS OF LAB. TECHNICIAN, JUNIOR ENGINEER (CIVIL), JUNIOR ENGINEER (ELECTRICAL), SURVEYOR, SIGN LANGUAGE INTERPRETER AND EXTENSION OFFICER (HTH) VIS-A-VIS ADVERTISEMENT (GROUP 'B' NON-GAZETTED POST) NO.5 OF 2024 – 2025 UNDER MIZORAM PUBLIC SERVICE COMMISSION

The examination shall comprise of the following Papers.

1)	Paper – I : General English	:	100 Marks (3 hours)
2)	Paper – II : General Knowledge (MCQ)	:	100 Marks (2 hours)
3)	Paper – III : Technical Subject (MCQ)	:	200 Marks (2 hours)
4)	Paper – IV : Technical Subject (MCQ)	:	200 Marks (2 hours)
	Total of Written Examination	:	600 Marks
5)	Personal Interview	:	80 Marks
	Total	**:**	**680 Marks**

Syllabus on Papers I & II shall be common for all the Posts mentioned in the Advertisement referred above. However, syllabuses on Technical subjects for the said posts are disparate and based on education qualification required for each post. Besides, except for the post of Extension Officer under Commerce & Industries Department all other posts have Technical Paper – IV in their respective syllabus.

DETAILED SYLLABUS:

Paper - I

1)	**General English**	**:**	**100 Marks (3 hours)**
a)	Précis Writing	:	10 marks
b)	Letter Writing	:	15 marks
c)	Comprehension of given passages	:	15 marks
d)	Grammar: Parts of Speech	:	20 marks
e)	Correct Usage and Vocabularies	:	20 marks
f)	Formation of Sentence	:	20 marks

Paper – II

1)	**General Knowledge (MCQ)**	**:**	**100 Marks (2 hours)**
(a)	Current events of state, national and international importance	:	12 marks
(b)	History of India and Indian National Movement	:	12 marks
(c)	Indian and World Geography - Physical, Social, Economic Geography of India and the World	:	12 marks
(d)	Indian Polity and Governance - Constitution, Political System, Public Policy, Duties & Rights Issues	:	12 marks
(e)	Economic and Social Development, Sustainable Development, Poverty, Inclusion, Demographics, Social Sector initiatives, and other related issues	:	12 marks
(f)	General issues on Environmental Ecology, Bio-diversity and Climate	:	12 marks
(g)	General Science	:	12 marks

The topics listed above shall cover the State of Mizoram wherever applicable.

(h) General awareness on Mizo culture, its heritage and society: 16 marks

SYLLABUS FOR DIRECT RECRUITMENT TO THE POST OF LABORATORY TECHNICIAN UNDER HEALTH & FAMILY WELFARE DEPARTMENT

PAPER – III (Technical Subject) (100 MARKS) (MCQ - 2 Hours)

Unit – I	Anatomy and Physiology	**10 Marks**
Unit – II	Biochemistry (Principles, Metabolism, Analytical Biochemistry, Applied Biochemistry)	**40 Marks**
Unit – III	Microbiology, (Basic Microbiology, Microbial technique, Bacteriology, Mycology, Immunology, Serology & Virology, Molecular Biology, Applied Microbiology)	**40 Marks**
Unit – IV	Parasitology	**10 Marks**

PAPER – IV (Technical Subject) (100 MARKS) (MCQ – 2 Hours)

Unit – I	Pathology & Clinical Pathology, Basic Laboratory Technique & instruments.	**20 Marks**
Unit – II	Hematology i) Basic, Technique, Systemic ii) Blood Banking & Immunohematology	**40 (30 + 10) Marks**
Unit – III	Histopathology (Basic, Technique)	**30 Marks**
Unit – IV	Cytopathology (Basic, Technique)	**10 Marks**

DETAILED SYLLABUS

Paper – III (Technical Subject) (Full Marks - 100) (MCQ - 2 Hours)

Unit – I **Anatomy & Physiology** **(10 Marks)**

a) Musculo skeletal system
- Bones :– types, structure and functions

b) Digestive System:–
- Gross anatomy of digestive organs
- Physiology of Digestion
  - ❖ Digestive juices – Secretion, Composition and functions

c) Respiratory System:–
- ❖ Gross anatomy of respiratory organs
- ❖ Physiology of respiration
- ❖ Oxygen and Carbon dioxide transport

d) Cardiovascular System :–
- ❖ Gross anatomy of heart and blood vessels

e) Excretory System:–

- ❖ Gross anatomy of excretory organs
- ❖ Function of Kidneys, mechanism of urine formation.
- ❖ Structure and function of Kidney

f) Reproductive System:−
- ❖ Gross anatomy of Male & Female reproductive organs
- ❖ Physiology of menstruation

g) Cerebro spinal fluid
- ❖ Formation, composition of CSF

h) Endocrine System:−
- ❖ Gross anatomy of endocrine organs
- ❖ Brief description of Endocrine hormone and their functions.

Unit – II **Biochemistry (40 marks)**

a) Introduction and scope of Biochemistry, cleaning and care of laboratory glass ware and equipments, preparation and storage of Distilled water, Analytical balance, calorimeter, spectrophotometer, pH Meter, flame photometer, S.I. unit of measurement, Preservation and disposal of biological sample, Basic statistics − mean, median, modes, SD, CV, normal reference ranges. Acid and base, pH, buffer solution, indicator, standard solution, storage of chemicals, water, electrolytes, acid base balance

b) * Carbohydrate, Lipids, Proteins − Classification, Properties, Biologicalimportance, functions.
- Amino acids, nucleic acids, Enzymes, Co−enzymes − Definition, classifications,Biological role/importance.

c) Glycolysis, TCA−cycle, Electron transport chain, Pentose Phosphate Pathway, Glyconeogenesis, Gluconeogenesis, Cori−cycle, Blood sugar and its regulation.

d) Fatty acid, cholesterol, lipoproteins, Purine ribonucleotide − Biosynthesis, utilization, Ketone bodies formation and its utilization.

e) Amino acids, vitamins, mineral − classification, Biological role, deficiency state.
- Transamination, Deamination, Biological importance of catecholamine, GABA,Serotonin, Histamine, Melanin.

f) * Tumour − markers − Brief history, classifications, clinical applications,Laboratory test (AFP,CEA,PSA)
- Liver function test, renal function test.
- Thyroid function test, Enzymes and co−enzyme in diagnosis of the diseases, Hormone analysis.
- Cardiac function test
- Qualitative test for − Carbohydrates, lipids, proteins, Bence Jonce's Protein
- Estimation of Serum electrolytes, and bicarbonates Blood sugar
- Quantitative test for organic constituent (Urea, uric acid, creatinine) inorganic constituent (sodium, Potassium, calcium, ammonia, chloride, Phosphate, bicarbonate and sulphate in urine with clinical significance and study of abnormal constituent or urine (glucose, Protein ketone bodies, blood, bile salt, bile pigments.

g) * Radio Immuno Assay (RIA)
- Enzyme Link Immuno sorbent Assay (ELISA)

- Chromatography (thin layer paper, gas, liquid Electrophoresis, (gelelectrophoresis, liquid electrophoresis)

<u>Unit - III</u> **Microbiology - (40 marks)**

a) * Introduction, brief history of Microbiology, origin of microbial life − theory of spontaneous generation.

*Safety measures in microbiology

- Classifications and nomenclature of bacteria (five kingdom concept)
- Sterilization − Principle, methods, antiseptic, disinfectants.
- General characteristic of Bacteria, anatomy of bacteria (shape, size,components)
- Growth and nutrition of bacteria, classification of bacteria on the basis of nutritional requirements, measurement of cell mass and factor affecting growth.
- Cultivation of microbes (Bacteria)
- Culture technique (media preparation and inoculation
- Isolation of Pure cultures (streak plate, spread plate, pours plate and serial dilution)
- Identification of microbes by colony morphology.

b) Bacteriology, Normal Micro flora of human body, Germ theory of diseases, microbial infection (types, sources and transmission)

- Bacterial toxin (Endotoxin & exotoxin)
- Bacterial morphology, isolation, identification, Pathogenicity, Lab diagnosis(Culture, Biochemical test, Hanging drop method for motility, Anaerobic, aerobic culture methods of staphylococcus, streptococcus, Neisseria Gonorrhea, N. meningitidis, Clostridium tetani & C. perfringens
- E.coli, Vibrio cholera, Salmonella typhi, Shigella, Mycobacterium / Mycobacterium tuberculosis, Spirochetes− Treponema pallidum.
- Collection, preservation, transportation of clinical specimens for microbial investigation.
- Bacteriological methods of examination of blood, faeces, pus, sputum, throat swab and urine
- Antibiotic sensitivity test (Disc diffusion and broth dilution methods)
- Hospital acquired infections and their control.
- Waste disposal and management

c) Instruments & Glass ware:

- Autoclave, Incubator, Laminar Airflow,
- Hot air oven, water bath, vortex shaker,
- Petri dish, test tube, screw cap tube, glass spreader/ L−rods, Pasteur pipettes.

d) Medical Mycology:

- Classification and nomenclature of fungi
- General characteristics, structures, reproduction, cultivation
- Medically important Division of fungi

- Morphology, culture characteristics, Pathogenicity, Lab diagnosis of Common Pathogenic fungi, (Aspergillus Sp., Candida Sp., Cryptococcus Sp., Dermatophytes, Penicillium Sp.)

e) Immunology
   - Introduction, Antigens (Types and properties) Antibodies/ Immuno globin types and properties)
   - Antigen − antibody reactions and their applications (Agglutination,precipitation, complement fixation and neutralization tests)
   - Immunity (Innate & Acquired)
   - Hypersensitivity
   - Immunodeficiency diseases

f) Serology
   - Quality control measures in serology
   - Common serological technique and their applications (VDRL, Widal, RA test,ASO, Pregnancy test, Hbs Ag and HCV, HIV, mantoux test)

g) Medical Virology
   - Classification, nomenclature, general characteristics (Morphology, chemical, biological properties and multiplication)
   - Cultivation of viruses (chick embryo, cell culture and animals)
   - Bacteriophages (lytic and lysogenic cycles)
   - Morphology, cultural characteristics, Pathogenicity and Laboratory diagnosis of the following viruses
     - ❖ Poliomyelitis
     - ❖ Mumps
     - ❖ Measles
     - ❖ Hepatitis A,B,C
     - ❖ Cytomegalovirus
     - ❖ Rabies
     - ❖ HIV/AIDS

h) Molecular Biology
   - Introduction
   - DNA & RNA
   - Isolation of DNA (Genomic & Plasmid)
   - Plasmids (types and Importance)

i) Principles, methods and application of
   - ELISA, Immunoflourescence test, Western Blot
   - PCR

<u>Unit - IV</u> **Parasitology (10 marks)**

a) Introduction, classification, characteristics of human parasites
   - Collection, storage and transportation of specimens, preservation of parasites
   - Morphology, transmission, life cycle, Pathogenicity and Lab. Diagnosis of :−
     - ❖ Entamoeba histolytica, Giadia Lamblia, Trichomonas vaginalis,

Leishmaniadonovani and L. tropica. Plasmodia species, Toxoplasma gondii, nematodes− Intestinal flukes, Blood flukes, Lung flukes, Liver fluke.

b) Common vectors of human diseases (mosquito, flies, ticks and fleas)

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PAPER – IV (Technical Subject) (Full Marks – 100 Marks) (MCQ - 2 Hours)

Unit – I: Pathology & Clinical Pathology , Basic Lab. Techniques & Instruments (20 Marks)

(a) Pathology − definition, Branches
- − Acute and Chronic inflammation (definition, characteristics)
- − Sub acute, granulomatous inflammation (definition, characteristics)
- − Changes in inflammation
- − Chemical mediators of inflammation

(b) Cell Injury
- − definition, causes, Ischaemia, necrosis
- − apoptosis, degeneration, dehydration

(c) cellular adaptation of growth and differentiation (Atrophy, Hypertrophy,Hyperplasia, Metaplasia, Dysplasia, Anaplasia)

(d) Neoplasia (Benign and Malignant, definition, characteristics, etiology, spread)

(e) Cell of Immune System (B&T lymphocytes, macrophage, dendritic and langerhan's cells, NK Cells)

(f) Laboratory organization, role of laboratory technicians and responsibilities, safety measures, instruments, reporting and recording, common laboratory accidents and its preventions, handling of infectious materials, preventions and disposal, reagents and its storage.

(g) Routine examination and clinical significant of −
- Urine
- Stool
- Body fluids (Ascitic fluid, pleural fluids, pericardial fluid, synovial fluids, CSFseminal fluids, sputum)
- Medico legal importance of semen analysis and abnormal morphology ofsperm

Unit – II: (i) Haematology (30 Marks)

(a) * Introduction to haematology
* Blood − components, collection, anticoagulants, preparation of smears & quality
* Haemoglobin, TLC, DLC with absolute count, WBC, Red cell indices,Reticulocytes (methods of estimation, clinical significant)
* Erythropoiesis, Granulopoiesis, Megakaryopoiesis (normal, abnormal & clinical significant)
* Blood parasites, bone marrow smears

(b) * Haemoglobin (normal and abnormal, Biosynthesis, Haemoglobinopathies and its investigation)

(c) RBC − structure, erythropoietin, functions

(d) WBC − Physiology, pathological variation

(e) Platelets − functions, purpuras, investigation of disorders, thrombocytosis, thrombocytopaenia

(f) Haemostasis (Coagulation) − Normal mechanism, abnormal, investigation of

abnormal haemostasis)

* Thrombosis − definition, causes

(g) Leukaemia − definition, classification (FAB), Acute & Chronic leukaemias, Lab. features of Acute & Chronic leukaemia (AML, ALL, CML, CLL) Aleukaemic Leukaemia, Leukaemoid reaction, Myelodysplastic syndrome (definition Lab. features)

(h) Anaemias (Normochromic, Normocytic, Megaloblastic, Microcytic hypochronic, Anaemia of infections, Haemolytic Anaemias) − Definition, classification, causes, laboratory, features and investigations)

(i) Thalassaemia (Trait, Minor, Major)

- Sideroblastic Anaemia
- Pancytopaenia, Aplastic Anaemias, Pure red cells aplasia (Definition, causes, lab. investigation etc)

(j) * Coagulation disorders, lab. diagnosis, causes, haemophillia, DIC

* lymphoma − definition, causes, classification, lab. features/diagnosis

* Myeloma − definition, causes, classification, lab. features/diagnosis

* Polycythaemia − definition, causes, classification, lab. features/diagnosis

* Purpuras − definition, causes, classification, lab. features/diagnosis

(k) Staining − Leishman's stain, MGG, Giemsa's, PAS, Sudan B−Black, Iron, Fats, NAP, Acid Phosphatase, Esterase (Principle, composition, methods & results)

(ii) Blood Banking & Immuno Haematology (10)

(a) Introduction

- Blood bank organization, equipments, donor registration
- Blood groups − types, technique of grouping
- Donor's selection, collection of blood
- Preservatives (storage), laboratory screening of blood for transfusion

(b) * Cross matching, compatibility testing

* Coomb's test

* Transfusion reaction

* Antigens, Antibodies (properties, production), Complements, Sensitization, Agglutination, Haemolysis, Neutralization, Precipitation, Complement fixation, Immune response.

(c) Diseases transmitted through blood and their screening, Haemolytic diseases of new born.

(d) Blood component preparation and its uses, Haemaphereis, Massive transfusion, Autologous transfusion, exchange transfusion.

<u>Unit – III</u>: Histopathology – Basic & Technique (30 Marks)

(a) * Cells and tissues − definition, cells and its organelles, function, cell cycle,mitosis meiosis

*Epithelial tissues, definition, classifications & functions

* Connective tissues (bone & cartilage)
* Muscle tissues
* Nerve tissues

(b) Histology of different systems & organs − Respiratory system, Alimentary system, Excretory systems, Reproductive system (male & female), Endocrine system.

(c) Histopathology technique −

- Sample reception, registering, labeling
- Fixative & fixation, (definition, classification, details of fixative, aims & object,fixation and preservation)
- Decalcification (definition, methods & test of end point decalcification)
- Grossing (definition, material required)
- Processing of tissues (manual & automatic)
- Waxes (types of waxes)
- Microtomies (types of microtome, knives, honing & stropping)
- Dehydration, clearing, impregnation, embedding or blocking (definition, chemicals used etc)
- Section cutting, mounting, labeling

(d) Immunohistochemistry (definition, purposes)

(e) Staining

- Theory, progressive & regressive, metachromasia, mordants, Accentators
- Staining preparation, procedures of −
  - Haematoxylene and Eosin stain
  - MGG stain ;connective tissue stains,
  - Giemsa's stain ; mucicarmine stains
  - Z.N. stain
  - PAS stain

<u>Unit – IV</u>: Cytology (Basic, technique) (10 Marks)

(a) Definition of cytology, material for operation and establishment of cytology laboratory, role of cytology in the diagnosis, branches of cytology

(b) * Reception, registration, numbering and supply of material for collecting specimens.

*Preparation of cytological smears

* Cytological fixation − aims & objects, chemical use for cytological fixation &methods of fixation

* Progressive changes of the cells.

*Nuclear criteria of malignancy

(c) * Exfoliative cytology − definition, source of samples for exfoliative cytology
*Body cavity fluid (Pleural effusion, Pericardial effusion, Ascitic fluids, sputum, urine, synovial fluids, CSF, Pus and Abscess)

− Methods of collection, fixation, methods of cytopreparations & staining

− Clotted & blood fluids (methods of cytopreparations)

− Cellular components in Benign and malignant effusion, acute and chronic inflammations

(d) Interventional cytology,(FNAC) Fine Needle Aspiration Cytology

− Definition

- Application, methods

- Role of

  FNAC

  - Common sites
  - Advantage & disadvantage, limitations
  - Complications, precaution & contra−indications
  - Preparation of smears
  - General properties of wet and dry smears
  - Imprint, crush smears, biopsy sediments, cell block preparations

(e) Aspiration of specific lesion eg. cyst, thyroid, lung, peritoneum, prostate, testis, radiological imaging aids for FNAC

(f) Methods of collection, fixation and cytopreparation of samples from − Female Genital tracts, Respiratory tracts, Gastro−intestinal tracts, urinary tracts etc.

(g) Staining

- Pap's stain
  - Chemical requirements, preparation of various chemicals for pap's stain
  - Various pap's stain methods
  - Types of haematoxylene and its preparation
  - Stain maintenance
  - Preparation of graded alcohols (50%, 60%, 70%, 80% , 85%)
  - Preparation of 0.5%Hcl, Lithium Carbonate, EA modified, 0.2%Hcl, 1% Ammonium hydroxide in 70% ethanol, Orange G−6
- Bismark Brown, EA−50, EA−36
  - Procedures of Pap's stain

- MGG stain
  - Giemsa's stain
  - Modified pap's stain
  - PAS stain, Alcian Blue Staining
  - Mayers & South Gate Mucicarmine stain
  - Gram's stain
  - ZN stains

Quality controls (Internal & External) definition, methods, advantage

SYLLABUS FOR DIRECT RECRUITMENT OF JE (CIVIL) UNDER HORTICULTURE DEPARTMENT

Paper – III (Technical Subject) (MCQ - 2 Hours)

Building materials (25 questions)	-	50 marks
Soil Mechanics and Foundation Engineering (25 questions)	-	50 Marks
Hydrology and rain water Harvesting (15 questions)	-	30 Marks
Design of RCC Building Members and RCC Water Tank (10 questions)	-	20 Marks
Protective Works, Slope stability and Land (25 questions)	-	50 Marks

Paper-IV (Technical Subject) (MCQ - 2 Hours)

Estimating, Costing and Valuation (25 questions)	-	50 Marks
Transportation Engineering and Surveying (25 questions)	-	50 Marks
Environmental Engineering (10 questions)	-	20 Marks
Design of Steel Structures and Steel Water Tanks (10 questions)	-	20 Marks
Professional practices (15 questions)	-	30 Marks
Aptitude Test (15 questions)	-	30 Marks

Paper – III (Technical Subject) (MCQ) (2 Hours)

1. **<u>Building Materials (50 Marks)</u>**
   Physical and Chemical properties, Classification, Standard Test, Uses and Types of Materials:- Building stones, Bricks, Silicate based materials, Cement and Mortars, Sand, Aggregates, Asbestos products, Timber and Wood based Products, Paints, Varnishes, Ferrous metals, Lubricants, Sealants for joints, Polymers and Plastics, Protective and decorative coatings.
2. **<u>Soil Mechanics and Foundation Engineering (50 Marks)</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, 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. Foundation engineering:- Foundation classification, Different type and selection criteria of foundation type, Requirements for a stable foundation, Minimum depth for shallow foundation, Definitions of bearing capacity of soil, Type of failure of soil below foundation footing, Determination of size of foundation footings.

3. **Hydrology and Rainwater harvesting-(30 Marks)**
   Hydrological cycle, Water budget equation, Precipitation :- forms, characteristics of precipitation on india, measurement, losses from precipitation. Run-off :- hydrograph, characteristics of streams, yield, droughts, surface water resources of india. Ground water :- forms, aquifer properties, geological formations as aquifers. Wells, Well losses, Specific capacity, Ground water capacity. Rainwater harvesting:- Definition of terms :- aquifer, artificial recharge, bore well, dry well, open wells, water table. Components of roof top rainwater harvesting and conservation system. Calculation of amount of rainwater that can be harvested from roof top. Design tanks. General recommendations for rainwater parameters for settlement harvesting. Quality of rainwater and method of treatment.

4. **Design of RCC Building members and RCC water tanks (20 Marks)** Principles of Limit state method (LSM) and Working stress method of design, Provisions of IS:456 and IS:13920 (Latest version) -Materials, workmanship, inspection, testing, placing and requirement of reinforcement, requirement of cement, aggregates and water. Water/Cement ration. Characteristic load & Strength, Partial factor of safety, Stress-strain characteristic of concrete and steel, Limit state of Durability, limit state of collapse in flexure and shear, limit state of serviceability. Theory and design of singly reinforced members. Bond, anchorage, development length and splicing. Design and IS code provisions for short columns, one way and two way slabs, isolated footing. RCC water tanks: Indian standard codes and provisions prescribed for designing water retaining structures, causes and control of cracking, joints in water retaining structures. Removal of formworks/shutters. Lining, lighting protection and ventilation of water tanks. Regular capacity and design capacity of water tanks. Classification and layout of elevated tanks. Nomenclature and functions of ancillary items of water retaining structures. Components of water retaining structures.

5. **Protective works, Slope stability and Landslide correction (50 Marks)**
   Design, construction, specifications and uses of Retaining walls, Breast walls, Toe walls, Crib walls and Revetment walls. Classification of slope movement. Causes of slope movement. Landslide investigations. Stability analysis, corrective measures and design considerations

PAPER –IV (Technical Subject) (MCQ - 2 Hours)

1. **Estimating, Costing and Valuation (50 Marks)**
   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, isolated 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.

2. **Transportation Engineering and Surveying (50 Marks)**

Highway Engineering cross sectional elements, geometric design, types of pavements, pavement materials aggregates and bitumen, different tests, Construction and specifications of Granular Sub-Base (GSB), Water Bound Macadam (WBM) and Wet Mix Macadam (WMM), Gravel Road, Bituminous distresses and construction. Rigid pavement joint, Type of pavement maintenance. Highway drainage. Traffic Engineering Traffic signals, traffic operation, traffic signs and markings, road safety. 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 leveling, 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.

3. **Environmental Engineering (20 Marks)**

Quality of water, source of water supply, purification of water, distribution of water, need of sanitation, sewerage systems, circular sewer, oval sewer, appurtenances, sewage treatments. Surface water drainage. Solid waste management - types, effects, engineered management system. Air pollution - pollutants, causes, effects, control. Noise pollution - causes, health effects, control.

4. **Design of Steel structures and Steel water tanks (20 Marks)**

Riveted and Bolted joints:- types and definitions. Riveted joints: assumptions in the theory. Failures, strength and efficiency. Design of riveted joints for axially loaded members. Welded joints: processes, types and symbols, advantages and disadvantages. Terms used in the design of fillet welds and butt welds. Compression members - effective length, maximum slenderness ratio, typical cross-section, design of compression members. Steel tanks :- Types of steel tanks commonly used, accessories commonly required, pressed steel tanks.

5. **Professional practices (30 Marks)**

Schedule of works, Schedule of rates (SOR), Analysis of rates, Technical specifications, Cost indices. Stages for execution of works:- administrative approval, expenditure sanction, technical sanction, deviations, extra and substituted items, contingencies, work charged establishment, Types of estimate. Tendering and Agreement sale, opening and acceptance of tenders, earnest money, performance guarantee, security deposit, extension of time, liquidated damage, advance payment to contractors. Measurement book writing, recording, testing of measurement, loss of measurement book. Contract - definition, essential elements of a valid contract, offer and acceptance. Free consent (Definition and consequences) coercion, undue influence, fraud, mis-representation, mistake. Special contracts :- indemnity, guarantee, bailment and pledge, agency.

6. Aptitude Test (30 Marks)

(a) Numerical And Figure work Tests: (8 Marks)

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

(b) Verbal Analysis And Vocabulary Tests: (8 Marks)

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

(c) Visual And Spatial/3-D Ability Tests: (6Marks)

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

(d) Abstract Reasoning Tests: (8 Marks)

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

DETAILED SYLLABUS ON PAPER III & IV (TECHNICAL SUBJECTS) FOR RECRUITMENT TO THE POSTS OF JUNIOR ENGINEER (ELECTRICAL, ELECTRONICS & MECHANICAL) UNDER POWER & ELECTRICITY DEPARTMENT.

Syllabus for Electrical Engineering:

1. Paper – III (Technical Subject) (MCQ) : 200 Marks (2 hours)

i) Power System-I

I. Generation of Electrical Power
   (1) Thermal Power Plants
   (2) Hydro Electric Generation Unit
II. Power Planning Economic and Tariff
III. Sub-Station : 60 marks

ii) Power System-II

I. Principle of Distribution System/Principle of Transmission and Distribution
II. Material of Overhead Lines
III. Concept on Line Design, Construction and L.A.
IV. Detail of Service Connection
V. Construction Details of Under Ground Cable
VI. CEA Safety Regulations : 60 marks

iii) Switch Gear and Protection-I

I. Protective Relays
II. Relay Application and Characteristics
III. Feeder Protection
IV. Generator Protection
V. Motor Protection
VI. Circuit Breakers : 30 marks

iv) Instrumentation and Control-I

I. Overview of Instrumentation and Control System
II. Pressure Measurement
III. Transducers
IV. Signal Conditioning : 30 marks

v) High Voltage Engineering (E)-I

I. Overview of the Power Generation, Transmission and Distribution
II. Measurement of High Voltages
III. Over Voltage : 20 marks

2. Paper – IV (Technical Subject) (MCQ) : 200 Marks (2 hours)

i) Electrical Machine-I

I. Transformer
II. Storage Batteries : 40 marks

ii) Electrical Machine-II

I. Induction Motor
II. Three Phase Synchronous Machine
III. Single : 30 marks

iii) Power Electronics/Electronic Devices & Circuits-II

I. The Thyristor and their Characteristics
II. Power Diodes & Power Transistors
III. Line Cumulated Converters
IV. A.C. Voltage Controllers
V. D.C. Chopper & Switch Mode power Supply
VI. Power Supplies
VII. A.C. Drivers
VIII. A.C. Voltage Control : 30 marks

iv) Repairing of Household Equipment-II

I. Ceiling Fan/Exhaust Fan
II. Fluorescent Lamp/Sodium Vapo
ur Lamp
III. Split Type/Window Air-Conditioning : 20 marks

v) Non-Conventional Sources of Energy

I. Solar Radiation
II. Wind Energy
III. Solar Cell : 80 marks

ELECTRICAL ENGINEERING -Paper-III **(Full Marks : 200)**

1. Power System – I **(60 Marks)**

I. Generation of Electrical Power

(1) Thermal Power Plants:-

i. Detail layout of thermal power station.
ii. Site selection and furnish the list of thermal power plants.
iii. Generating capacity of the thermal power plants.
iv. Working principle of the following (a) Coal handling Plant (b) Alternators (c) Condensing plant (d) Water treatment plant (e) Ash handling system (f) Station auxiliaries (g) Pulverising system (h) Steam system (i) Turbine system.

(2) Hydro Electric Generation Unit :-

i. Developing a Hydro Electric reasons for developing a Hydro Electric Project.
ii. Type of hydro electric project.
iii. List of hydro electric projects and their capacities.
iv. Detail layout of the hydro electric project.
v. The Alternator, the Computing system and turbine of the hydro-electric project.
vi. The station auxiliaries of the hydro electric projects.

II. Power Planning Economic and Tariff.

i. To define –
(a) Demand (b) Load Curve (c) Maximum Demand or Peak Load (d) Connected Load (e) Demand factors (f) Load factor (g) Diversity factor (h) Plant factor.

III. Sub-Station

i. To define sub-station.
ii. To prepare the list of equipment of a sub-station.
iii. To design the layout of a transmitting sub-station.

2. Power System – II **(60 Marks)**

I. Principle of Distribution System/Principles of Transmission and Distribution

i. The transmission system and Distribution system.
ii. Transmission efficiency with the variation of system voltage/The principle of choice of voltages in generation, transmission & distribution.
iii. Compare the overhead and underground distribution.
iv. To describe(a) 2 Wire DC System (b) 3 wire DC system (c) Single phase AC (d) Three phase AC system.

II. Material of Overhead Lines

i. Characteristics and their application of (a) Poles and wood poles (b) Treatment of wood poles (c) Concrete Poles (d) Steel tubular poles (e) Rail poles (f) Steel towers with cross arms brackets (g) Stays struts and other line accessories like arcing Home etc. suspension clamp, strain clamp, snail clamp, tubular compression dead end etc and binding wires dampers etc.
ii. Characteristics & field of application of (a) Shackle Insulators (b) Pin Insulators (c) Post Insulators (d) Distributors (e) String Insulators.

III. Concept on Line Design, Construction and L.A.

i. To describe the rules & practices on (a) Selection of conductors size (b) Arrangement and spacing of conductor (c) Selection of height of poles or Towers (d) Clearances between power lines (e) Selection of span (f) Maintaining the clearance from building (vertical & Horizontal (g) Earthing and counterpoise of transmission and distribution line.

IV. Detail of Service Connection

i. Layout of the low and Medium voltage Distribution System.
ii. The detail of service connection of overhead line (low and medium voltage.
iii. The relevant IE Rules IS specification regarding the tests before giving service connections.
iv. Insulation testing & earth testing.

V. Construction Details of Underground cable

i. Types of cables.
ii. Standard size of cables & their field of applications (To write the specification of underground cable).
iii. The method of cable laying.
iv. To describe the method of cable joints for (a) PILC cable (b) XLPE cable (c) PVC cable.
v. Type of tests for commissioning of cables.

VI. CEA Safety Regulations :

i. To state the CEA Safety regulations related to (a) Overhead lines (b) Conductors at different voltages on same supports (c) Erection of or alternation to building structure flood banks and elevation of roads (d) Clearance (e) Routes (f) Maximum intervals between supports (g) Same structure carrying the Telecommunication lines (h) Lines crossing or approaching each other (i) Guarding (j) Service from OH Line (k) Earthing (l) Metallic bearer wire used for supporting insulated cables (m) Protection against.

3. Switch Gear and Protection – I **(30 Marks)**

I. Protective Relays

i. To describe the following (a) causes of faults (b) consequences of faults (c) relay protection (d) zones of protections.

II. Relay Application and characteristics

i. To describe the functions and operating principle of (a) over current relays (b) instantaneous over current relay (c) application of time current relays (d) time-graded protection with over current relays (e) directional relays (f) directional over current relays and their connections (g) distance relays (h) Impedance relay (i) Ohm relay (j) differential relays.

III. Feeder Protection

i. To describe the protection and their selection
ii. To explain the principle of over current protection in respect of (a) non-directional time and current grading (b) directional time and current grading (c) over current earth fault protection (d) directional earth fault relays (e) Earth-fault detection in systems earth through A.C. suppression oil.

iii. Apparatus protection.
(i) Transformer protection.
(ii) To describe (a) the nature of transformer faults (b) faults in auxiliary equipment (c) winding faults (d) overloads and external start-circuits (e) differential protection of transformers (f) problems encountered in differential protection of transformers.

IV. Generator Protection
i. To describe type of generator faults e.g. (a) stator fault (b) Rotor fault (c) Abnormal running conditions.
ii. To describe (a) the stator protection systems (b) the rotor protection systems (c) the field feature protection (d) unbalanced load up protection (e) over load protection (f) prime mover protection (g) over speed protection (h) over voltage protection.
iii. To describe (a) the protection of generator transformer unit (b) relay tripping functions.

V. Motor Protection
i. To describe different type of motor faults.
ii. To describe the protection systems of (a) stator (b) Rotor (c) over load (d) unbalance and single phasing (e) under-voltage (f) Reverse phase protection (g) loss of synchronism.

VI. Circuit breakers
i. Theory of circuit interruption.
ii. To state the rating of a circuit breaker.
iii. To define the effect of re-striking voltage transients.
iv. To describe this interaction between the breaker and circuit.
v. To classify (a) current dropping (b) duties of switch gear.
vi. To describe (a) automatic switch (b) air circuit breakers (c) oil circuit breakers (single break and multi-break construction) (d) Air blast circuit breaker (e) performance of circuit breakers and system requirements (f) terminal start air unit and R.R.R.V. (g) interruption of small inductive and capacitive currents (h) modification of circuit breaker duty by shunt resistors.
vii. To state the recent developments in circuit breakers.

4. Instrumentation and Control – I **(30 Marks)**

I. Overview of Instrumentation and control system
i. To list the basic components of instrumentation system such as -
(a) Measurement system.
(b) Information signals and system.
(c) Intelligent versus dumb instrumentation.
ii. To discuss the basic idea of the control systems such as -
(a) Automatic control systems.
(b) Types of control system.
(c) Definition of controller.

II. Pressure Measurement
i. To describe the concepts of pressure measurement in (a) mechanics (b) mechanics (b) hydraulics (c) kinetics (d) thermodynamics.

III. Transducers

i. To describe the characteristics of Electrical Transducers.
ii. To describe the criterion for the selection of Transducers.
iii. To describe (a) the principles of different type of resistive transducer (b) different type of inductive transducer (c) capacitive transducer (d) photoelectric transducers (e) thermoelectric transducers (f) ultrasonic temperature transducers (g) magnetic flow meters (i) measurement of thickness by beta gauge.

IV. Signal Conditioning

i. To describe the basic principle (a) D.C. (b) A.C. signal conditioning (c) Data Acquisition and conversion system.
ii. To describe the basic instrumentation Amplifier.

5. High Voltage Engineering (E) – I **(20 Marks)**

I Over view of the power generation, transmission and Distribution

i. To describe the generation & Transmission of Electrical Energy.
ii. Define (a) voltage stresses (b) Testing voltages.

II Measurement of High Voltages

i. Type of voltages to be measured & their wave shapes.
ii. The measurement of (a) peak voltage by spark gap (b) state the effect of nearby earthed objects (c) state the effect of humanity (d) effect of radiation & of polarity (e) influence of dust particles (f) effect of rod gaps.
iii. The working principle of Electrostatic Voltmeters.
iv. High voltage measurement by ammeter in series with high resistance method.
v. The generating or rotating voltmeters.
vi. Suppression of disturbances.
vii. Calibration of PD – Detectors in a Test Arrangement.

III Over voltage

i. The lightning mechanism.
ii. To state the (a) Energy in Lightning (b) Nature of Danger.
iii. The simulated lightning surges for testing.
iv. The switching surges test voltage characteristics.

ELECTRONICS ENGINEERING Paper-III (Full Marks : 200)

1. ELECTRONIC DEVICES AND CIRCUITS — 60 Marks

Unit-I Semiconductor and Diodes:

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

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

Unit-II Bipolar Junction Transistor:

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

Unit-III Transistor Oscillators and FET and UJT:

Transistor oscillator – Classifications – Condition for oscillations (Barkhausen criterion) – Hartley Oscillator – Colpitts Oscillator – RC Phase shift oscillator, Crystal oscillator. **Field Effect Transistor** – Construction – Working principle of FET – Difference between FET and BJT – Characteristics of FET – Applications – FET amplifier (Common source amplifier).

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

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

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

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

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

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

Unit-V Opto Electronics Devices and waveshaping circuits:

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

2. DIGITAL ELECTRONICS - 40 Marks

Unit-I: Number System and Boolean Algebra:-

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

Unit-II: Combinational Circuits:

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

Unit-III: Sequential Circuits

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

Unit-IV : Memory Devices

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

Unit-V: Microprocessor-8085

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

3. LINEAR INTEGRATED CIRCUITS - 40 Marks

Unit-I: Introduction to Operational Amplifiers

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

Unit-II: Opamp Applications

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

Unit-III: PLL & Applications

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

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

Digital to analog converter – Basics of D/A conversion-R-2R Ladder D/A Converter Analog to digital converter-Basics of A/D Conversion-sampling-Sample and hold circuitquantization - Types of A/D converter.

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

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

4. MICROCONTROLLER - 30 Marks

Unit-I:Architecture & Instruction set of 8051:

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

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

Unit-II: Programming Examples:

Structure of Assembly Language - Different addressing modes of 8051.

Unit-III: I/P and Timer:

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

5. ELECTRONIC SYSTEM DESIGN - 30 Marks

UNIT-I:

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

UNIT-II:

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

UNIT-III:

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

UNIT-IV

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

UNIT-V:

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

MECHANICAL ENGINEERING Paper-III **(Full Marks : 200)**

Unit I : Mechanics of Materials : **- 35 Marks**

Hooke's law, Young's modulus, Shear modulus of rigidity, Poisson's ratio, generalized Hooke's law for two dimensional stress, relation among the elastic constants for an isotropic material determination of principle stresses and strains. Stresses in welded joints: butt weld and fillet weld. Determination of principal stresses and strains, thin walled cylindrical and spherical pressure vessels. Simple bending of beams, torsion of shaft, columns and struts

Unit II Design of machined elements : **- 25 Marks**

Material behaviour and design factors for dynamic load; design of circular shafts for bending and torsional load only; design of screwed joints; design of belts and gears for transmission of power.

Unit III : Theory of Machines : **- 35 Marks**

Kinematic and dynamic analysis of plane mechanisms. Cams, Gears and epicyclic gear trains, flywheels, governors, balancing of rigid rotors, balancing of single and multicylinder engines. Ropes, belts and chain drives. Functions of Brakes, clutches and dynamometers.

Unit IV : Machine Tools : **- 25 Marks**

Metal cutting and cutting tools- Metal cutting by chip forming process, drives and mechanisms in machine tools- Machine tool motions, Lathe- types of lathe tools and their uses; drilling machine- Operations, classification, specifications. Shaper, Planer, Slotter and broaching - Operations, classification, specifications. Operations, classifications, specifications of Milling machine, Boring machine, Grinding machine, Gear hobbing machine, Capstan & Turret lathe. Principles of numerical control; operation of NC, CNC and DNC systems: point-to-point, continuous path / contour system.

Unit V : Manufacturing Processes : **- 35 Marks**

Mechanical properties of metals and alloys, manufacturing of iron and steel, carbon and alloy steels. Metallurgy in manufacturing, Microstructure of Metals, Equilibrium diagram of alloys. Heat treatment of steel, Casting processes. Fabrication processes- mechanical joining, adhesive joining, welding, brazing and soldering. Gas welding and cutting, electric Arc welding and cutting. Metal working processes - Forging and rolling.
Non-conventional machining : Chemical Machining, Electrochemical Machining, Electro Discharge Machining (EDM), Laser Beam Machining, Electron Beam Machining, Water Jet Machining, Abrasive Jet Machining.

Unit VI : Production Management : **- 35 Marks**

Plant location and layout, material handling- Factors affecting plant location; necessity of plant layout; process and product layout; work station design; procedural steps for making a plant layout ; Demand forecasting, Production planning and control measures. Product inspection and quality control; raw materials management and inventory control.
Work study - Concept and objectives of work study; method study procedure: flow process chart, flow diagram; principles of product design for mass production and simple operations research (OR) models.

Unit VII Mechanical Measurement : **- 10 Marks**

Concept of fits and tolerances; tools and gauges; comparators; inspection of length; position, profile and surface finish. Linear measurement, angular measurement; measurement of screw threads and gears.

Machine tool metrology - Tests for level of installation of machine in horizontal and vertical planes.

ELECTRICAL ENGINEERING Paper-IV **(Full Marks : 200)**

1 Electrical Machine – I **-40 marks**

(a) Transformer :-

i. Basic principle.
ii. Classification of transformer based on.
iii. Application.
iv. Construction.
v. Construction of transformer.
vi. List of components used.
vii. Type and nature of cooling of transformer.
viii. Working principle of transformer.
ix. Describe transformer on (a) no-load (b) full load.
x. Derive the emf equation of transformer.
xi. Effect of leakage flux and leakage reactance of transformer.
xii. Phase and diagram on no load (specify whether ideal or actual).
xiii. Percentage resistance, reactance and impotence of transformer.
xiv. Different type of losses in transformer.
xv. Calculate the loses and efficiencies of transformer.
xvi. Condition for maximum efficiency of transformer.
xvii. Procedure for testing of transformer.
xviii. Open circuit test and short circuit test.
xix. The voltage regulation of a transformer.
xx. Construction of Auto transformer.
xxi. Working principle of Auto transformer.

(b) Storage Batteries :-

i. Type of storage batteries.
ii. Construction of Lead Acid battery.
iii. Working principle of Lead Acid battery.
iv. Special feature of maintenance free battery.
v. Defects in storage batteries.
vi. The method of battery maintenance.
vii. Different method of battery charging.
viii. Different battery charging circuit for (a) Constant voltage (b) Constant current charging.
ix. Method of testing, fault diagnosis and repair of batteries.
x. Safety procedure for battery.
xi. Method for prevention of environmental pollution.

2. Electrical Machine – II **-30 Marks**

I. Induction Motor

i. Explain the constructional features of three phase induction motor.
ii. Explain the method of the production of rotating magnetic fields produced in a three phase stator winding when three phase supply is applied in it.
iii. To define slip, synchronous speed.
iv. Working principle of an three phase induction motor.

v. To develop an expression for torque in three phase induction motor.
vi. Method of achieving high starting torque of an three phase induction motor.
vii. Explain various methods starting induction motor.
viii. The modern techniques of starting different types of induction motor.
ix. Explain different method of speed control in three phase induction motor (conventional method).
x. The modern method of speed control of three phase induction motor.
xi. State and enumerate different losses in three phase induction motor.
xii. To determine the efficiency of three phase induction motor considering the losses in the motor.
xiii. The various methods for testing of induction motor.
xiv. The various components in Test Report.
xv. State various factors involved in installation of a three phase induction motor.
xvi. The various step for the maintenance of induction motor.
xvii. The working principle of single & three phase induction regulator.

II. Three phase synchronous Machine
i. Constructional detail of three phase synchronous machine.
ii. Basic principle of developing three phase armature windings.
iii. Voltage regulation by synchronous impedance method.
iv. Method of synchronise the incoming alternator with three phase bus bar.
v. Local sharing between two alternators in synchronized mode.
vi. Why synchronous motor is not self-starting.
vii. Change in excitation of a synchronous motor on armature current.
viii. Application of synchronous machine.
ix. Condition/factors for the application of synchronous machine.
x. Testing the synchronous machines and to determine their performance characteristics.

III. Single
i. Type of single phase motors.
ii. Construction of various type of induction motor (split phase type).
iii. Construction & working principles of single phase synchronous motor.
iv. Construction & working principles of single phase commutator motor.
v. Testing procedure of single phase induction motor measurement of (i) speed (2) power consumption (3) torque.
vi. Selecting a specific type of single phase induction motor for a particular purpose.

3. Power Electronics / Electronic Devices & Circuits – II **-30 Marks**

I. The Thyristor and their characteristics
i. The construction, working principle, characteristics and rating of (a) Power diode (b) Silicon controlled rectifier (c) Power Transistor (d) Gate turn off Thyrister (GTC) (e) Triac (f) Disc.
ii. To classify thyristors.
iii. To explain the basic principle of selection of Thyristors a) Overloads & fault current b) Voltage rating c) Di/dt behavior of thyristor d) Series parallel operation e) Current sharing during switching.

II. Power Diodes & Power Transistors
i. To classify power diodes & state their characteristics and field of application.
ii. To describe (a) forward recovery (b) Reverse recovery characteristics of power diode.
iii. To describe (a) the static characteristics of transistor (b) Turn-n & Turn off times of transistor (c) Second break down in transistor (d) Breakdown voltage of transistor.

(e) Base drive circuit of transistor.

III. Line Cumulated Converters

i. To define (a) Converter (b) Inverter.
ii. Line commulated converter in terms of quadrant of conversion.
iii. The equation for output voltage (a) Three phase half wave converter (b) Three phase semi-converters (c) Three phase full controller (d) Three phase dual converter.
iv. The method of power factor improvement for phase controller converters.
v. Basic considerations for designing converter circuits.

IV. A.C. Voltage Controllers

i. The principle of AC voltage control.
ii. Describe the principle of (a) ON, OFF control and (b) Phase control for single phase toads (Star/Delta connected loads).
iii. Single phase tap changer circuits.

V. D.C. Chopper and Switch Mode Power Supply

i. Define the DC Chopper and their field of application.
ii. The principle of step down and step up operation.
iii. Voltage control in single phase inverters.

VI. Power supplies

i. Purpose for developing AC & DC power supply (in industries).
ii. The principle of operation of a) Switched mode DC power supply b) AC power supplies & VPS configuration.

VII. A.C. Drivers

i. To list different method of AC motor control.
ii. To draw the schematic diagram of (a) Stator voltage control (b) Rotor voltage control (c) Frequent control (d) Stator voltage and frequency control (e) Stator current control (f) Voltage current and frequency control.

VIII. A.C. Voltage Control

i. To list Describe operating principle of (a) constant voltage transformer (b) Servo controlled voltage stabilizer.
ii. Describe the working principles of different type of Electro Magnetic Interface suppressor.
iii. Dielectric and induction heating.

4. Repairing of Household Equipment – II **-20 Marks**

I. Ceiling fan/Exhaust Fan

i. To describe and draw the diagram of a ceiling/exhaust fan.
ii. To describe the electrical circuits of ceiling/exhaust fan.
iii. To describe the fastening of the components of ceiling/exhaust fan.
iv. To describe the dismantling procedure of a ceiling/exhaust fan.
v. To state the precautions required to dismantle the ceiling/exhaust/fan.
vi. To state the procedure for repair of the ceiling/exhaust fan.
vii. To describe the process of preventive maintenance.

II. Fluorescent Lamp/Sodium Vapour Lamp

i. To draw and describe the circuit of the lamp filling.
ii. To explain the function of each components.
iii. To state the procedure for dismantling.
iv. To enlist the probable faults in the fitting.
v. To state the procedure for repair of the circuit.
vi. To perform the repair work.
vii. To state the assembly procedure.
viii. To suggest testing procedure.

III. Split type/Window Air-conditioning

i. The function of control terminals on the remote control unit.
ii. The electrical (in some cases block diagram/functional diagram) for checking the operation.
iii. The procedure for testing without dismantling for detecting or isolating the fault.
iv. The procedure for testing after dismantling for detecting or isolating the fault.
v. To describe the procedure for the repair replacement of detective components.
vi. The testing procedure for the compressor or costing unit/without dismantling.
vii. The procedure for commissioning of the Air Conditioner of the repair.

5. Non-Conventional Sources of Energy (E) – II **-80 Marks**

I. Solar radiation **-30 Marks**

i. To describe (a) Global, direct and diffused radiation (b) Spectral distribution of direct solar radiation through four types of curves (c) Radiation measuring Instruments (d) Data from a radiation measurement network.
ii. Water & Air heating application – To describe the construction and uses of water heating system through – (a) flat plate collector (b) spiral or 'sea shell' collector (c) heat pipe collector (d) Cylindrical heater/storage system.
iii. To describe three types of air heaters used to dry crop in lower latitude or space heating in higher latitude.
iv. To describe the integration of an air collector into a heating and cooling system.
v. To know some storage units.
vi. Space heating application: To describe the utilization of air heater and thermal energy storage in space heating application.
vii. Thermal Power & other applications (a) Head Engine (b) Large scale power Generation (c) Furnaces (d) cookers (e) refrigeration & cooling (f) Heat pumps (g) solar ponds.
(h) distillation (i) industrial application of process heat and transport.
viii. Photovoltaic Technology: (a) Principle of solar cells (b) Solar cells & modules (c) Applications of photovoltaic system (d) Photovoltaic Power Generation.

II. Wind Energy **-25 Marks**

i. To state the historical development of wind generated Electricity in the following countries (a) Denmark (b) USA (c) United Kingdom.
ii. To enumerate the wind energy potential.
To state the annual velocity & power duration curves.
To describe the windmill.
To describe the use of wind energy as (a) power generation (b) water pumping system.
To describe the method of wind Energy conservation, distribution & utilization system.

III. Solar Cell **-25 Marks**

i. Photo voltaic systems components and application.
The principle of energy storage system.
The principle of power condition system.
The principle of voltaic applications.
ii. Design of stand Alone system.
Describe (a) The solar module performance (b) Battery performance (performance of lead Acid Battery, Nickel cadmium Batteries) (c) Power control system (d) The method of regulation & system sizing (e) To state the application in water pumping.

ELECTRONICS ENGINEERING Paper-IV **(Full Marks : 200)**

1. ELECTRICAL CIRCUITS AND INSTRUMENTATION - 60 Marks

Unit-I : D.C. CIRCUITS AND THEOREMS

Definition and unit for voltage, current, power, resistance, conductance, resistivity – Ohm's law – Kirchoff's current law and voltage law. Series circuits – parallel circuits – series parallel circuits – Thevenin's, Norton's, super position and maximum power transfer theorem – Statement and explanation.

UNIT-II : A.C. CIRCUITS AND RESONANCE

AC through single pure resistance, pure inductance, pure capacitance – voltage and current relationship – the equation for power and power factor in each case - Definition for impedance, reactance, admittance, conductance, impedance, phase angle, power factor and power. Resonance - series resonance – parallel resonance – condition for resonance – resonant frequency – Q factor – resonance curve – bandwidth.

UNIT-III : TRANSFORMERS AND MACHINES

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

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

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

UNIT-IV : MEASURING INSTRUMENTS AND CRO

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

UNIT-V : TRANSDUCERS & TEST INSTRUMENTS

Transducers – classification of transducer – Types - uses. Construction, operation and application of photo electric transducer, LVDT and Load cell. Principle of working of Thermocouple - Temperature measurement using thermocouple - list of applications - Principle of working of Thermistor - Temperature measurement using thermistors – types (NTC, PTC) – List of applications. Digital voltmeter – Types (to list only) Advantages over analog instruments.

2. INDUSTRIAL ELECTRONICS - 60 Marks

UNIT-I: POWER DEVICES AND TRIGGER CIRCUITS

Thyristor family – Working principle, VI characteristics and applications of SCR – Definitions for holding current, latching current, dv/dt rating - Insulated gate bipolar transistor (IGBT), MOSFET and GTO – Symbol - principle of working, VI characteristics and applications - Triggering of SCR –

Gate triggering – Types – Concepts of DC triggering, AC triggering, Pulse gate triggering – Pulse transformer in trigger circuit- Electrical isolation by opto isolator – Resistance capacitor firing circuit and waveform, Synchronized UJT triggering (ramp triggering) circuit and waveform.

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

Converters – Definition – Single phase Half controlled bridge converter with R load and RL load – importance of flywheel diode - Single phase fully controlled bridge converter with resistive load - voltage and current waveforms - Single phase fully controlled bridge converter with RL load - voltage and current waveforms. Commutation - Natural commutation - Forced commutation - Type of forced commutation. Chopper – Definition - principle of DC chopper operation - Applications of DC chopper – Principle of working of single phase AC chopper.

UNIT-III INVERTERS & APLLICATIONS

Inverter – Definition – Requirement of an inverter – Single phase inverter with resistive load - Single phase inverter with RL load - Methods to obtain sine wave output from an inverter – Output voltage control in inverters - Parallel inverter using IGBT. HVDC Transmission – principle – advantages – drawbacks SMPS – Block diagram of SMPS – Working principle – advantages and disadvantages. UPS – Working principle - Type (ON Line, OFF Line), Comparison.

UNIT-IV: PROGRAMMABLE LOGIC CONTROLLER

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

UNIT-V NUMERICAL CONTROL SYSTEMS

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

3. COMMUNICATION ENGINEERING - 30 marks

Unit-I: Networks, Antenna and Propagation

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

Unit-II: Amplitude Modulation

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

Unit-III: Angle and Pulse Modulation

Frequency modulation - Frequency spectrum - effects of noise in FM - comparison of AM and FM - FM Transmitters & Receiver - Direct and Indirect methods - Phase Modulation Principles Pulse Modulation types - Generation and detection of PA, PWM, PPM, PCM, DPCM, Delta modulation.

Unit-IV : Audio systems

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

Unit-V : Video systems

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

4. COMPUTER HARDWARE AND NETWORKS - 30 Marks

Unit-I: MOTHERBOARD COMPONENTS AND MEMORY STORAGE DEVICES

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

Processors : Architecture and block diagram of multicore Processor

Bus Standards Overview and features of USB

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

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

Removable Storage : CD&DVD construction-reading & writing operations; CD-R, CD-RW; DVD ROM,

DVD-RW; construction and working of DVD Reader/Writer.

Blue-ray: Introduction

Unit-II: I/O DEVICES AND INTERFACE

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

Printers : Introduction – Types of printers-Operation-Construction-Features and Troubleshooting. I/O Ports : Serial, Parallel, USB, Game Port, Bluetooth interface, IR connector, fire ware.

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

Modem: Working principles-common problems and solutions.

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

SMPS : Principles of Operation.

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

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

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

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

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

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

Unit-IV: COMPUTER NETWORK DEVICES AND OSI LAYERS

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

5. EMBEDDED SYSTEM - 20 marks

Unit-I:

ARM PROCESSOR ARCHITECTURE : The RISC and ARM design philosophy, Embedded System
Hardware.
ARM PROCESSOR FUNDAMENTALS : Data Flow Model, registers, modes of operation.
ARM Nomenclature and families.

Unit-II:

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

Unit-III:

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

Unit-IV:

MEMORY PROTECTION AND MANAGEMENT UNIT : Introduction to protection unit.

Unit-V:

EMBEDDED OS AND RTOS : Fundamental Components to Embedded OS.

MECHANICAL ENGINEERING. Paper-IV **(Full Marks : 200)**

Unit I : Fluid Mechanics : - **20 Marks**

Fluid and properties of fluid. Pressure and its measurement -Intensity of pressure; pressure head; Pascal's Law. Equilibrium of floating bodies- Archimedes' principle; buoyancy and principle of floatation. Flow of fluid and flow through pipes- Chezy's equation and Dancy's equation of head loss, Reynold's number and its effect on pipe friction; open channel flow and flow measurement.

Unit II : Fluid Machines : - **30 Marks**

Various types of pumps, reciprocating pump; centrifugal pump; axial flow pump and jet pump. Classification of water turbines- Impulse turbine (Pelton wheel); inward flow reaction turbine (Francis turbine) and axial flow reaction turbine (Kaplan turbine)

Unit III : Thermal Engineering : - **35 Marks**

Basic concept of First law and second law of Thermodynamics; concept of entropy and reversibility; availability and unavailability and irreversibility. Steam generation- modified Rankine cycle analysis. Modern steam boilers properties of steam, Steam engine- Classification of steam engines; Function and use of steam turbines, Function of a steam condenser, elements of a condensing plant. Type and size of a steam power plant; essential equipment of a steam power plant; coal handling system; pulverized coal firing system.
Function and use of gas turbines- Principle of operation, closed cycle and open cycle, constant pressure and constant volume gas turbine.

Unit IV : I.C. Engines : - **35 Marks**

IC engines - Classification of IC engines; working principle of 2-stroke and 4-stroke cycles IC engines; SI engine and CI engine; Otto cycle; Diesel cycle; dual-combustion cycle. Firing order of multi cylinder engine; Types of Fuels- additives; knocking, compression ratio, octave rating; cetane rating; Governing of SI and CI engines. Super-changing and turbo-changing of IC engines.

Unit V : Automobile Engineering: - **30 Marks**

Automobile components, automobile engines-classification and components, petrol and diesel engine. Fuel system- Working principle of difficult types of modern carburetors. Different types of engine cooling systems. Principles of different types of lubrication system- petrol, splash, semipressure, pressure, wet-sump, dry sump. Power train- transmission, clutch and gear boxes and function of propeller shaft. Principle of braking system; functions of Suspension system and Steering system; types of commercial vehicle wheels.

Unit VI : Refrigeration and air-conditioning - **30 Marks**

Concepts of refrigeration and air-conditioning system. Thermal principles- heat transfer by conduction, convection and radiation, heat exchangers, vapour compression system and vapour absorption system.

Psychrometry - properties; processes; charts; sensible heating and cooling; humidification and dehumidification effective temperature; air-conditioning load calculation. Determination for comfort condition and simple load calculations. Concept of an air-conditioning and distribution system

Unit VII : Mechanical Estimation - 20 Marks

Elements of cost, Components of cost, Indirect expenses. Forms of materials, procedural steps for calculating material cost of a product. Estimation in machine shop, forging, welding and sheet metal shop.

Calculation for machining time, machining cost of machined items.

DETAILED SYLLABUS ON PAPER III & IV (TECHNICAL SUBJECTS) FOR RECRUITMENT TO THE POST OF SURVEYOR UNDER LAND REVENUE & RESETTLEMENT

Paper	Subject	Marks	Duration
Paper - III	**1. Introduction of surveying** 1) Concepts and purpose of Surveying. 2) Instrument used for Linear and angular measurement. 3) Classification of Survey based on Instrument used. 4) Classification based on Method used. 5) Fundamental Principles of Surveying. 6) Process of Surveying. 7) Cadastral Survey.	**50**	2 hours with compensatory time of 20 minutes per hour for persons with benchmarked disabilities
	2. Chain Survey 1) Definition 2) Methods of Chain Survey 3) Instrument used	**20**	
	3. Compass survey 1) Definition 2) Methods of Chain Survey 3) Instrument used	**20**	
	4. Plane Table Survey 1) Principles of Plane Table Survey 2) Accessories 3) Methods	**20**	
	5. Levelling Survey 1) Definition 2) Methods 3) Principles of leveling booking and reducing levels	**20**	
	6. Theodolite Survey 1) Theodolite Traverse 2) Source of error in Theodolite 3) Mistakes in Theodolite	**20**	
	7. Modern Survey instruments **a. GPS** 1) Types of Instrument 2) Methods used for survey with GPS 3) Advantages **b. Total Station** 1) Components of Total Station 2) Advantages 3) Procedures of Total Station a. Traversing b. Layout of points	**30**	
	8. Cartography - Introducing to Cartography	**20**	
	TOTAL	**200**	
Paper – IV	**MATHEMATICS** **Geometry** 1) Triangle	**50**	2 hours with compensatory time of 20

	2) Similar Figures 3) Similarity of Triangles 4) Areas of Similar Triangles 5) Pythagoras Theorem 6) Circles 7) Construction of Tangents to a circle 8) Division of Line Segment		minutes per hour for persons with benchmarked disabilities
	Coordinate Geometry 1) Distance Formula 2) Section Formula 3) Area of Triangle	**40**	
	Trigonometry 1) Trigonometry Ratios 2) Trigonometry Ratios of Some Specific Angles 3) Trigonometry Ratios of Complimentary Angles 4) Trigonometry Identities 5) Heights and Distances	**50**	
	Mensuration 1) Area related to Circles 2) Areas of Sector and Segment of a circle 3) Areas of Combination of Plane Figures 4) Surface Areas and Volumes	**40**	
	Statistics 1) Mean of Grouped Data 2) Mode of a Grouped Data 3) Median of a Grouped Data 4) Graphical Representation of Cumulative Frequency Distribution.	**20**	
	TOTAL	**200**	

DETAILED SYLLABUS ON PAPER III & IV (TECHNICAL SUBJECT) FOR RECRUITMENT TO THE POST OF SIGN LANGUAGE INTERPRETER UNDER SOCIAL WELFARE, TRIBAL AFFAIRS, WOMEN & CHILD DEVELOPMENT

Paper	Subject	Marks	Duration
Paper III Technical	Indian Sign Language Interpretation: Theory	200 (MCQ)	2 hours with compensatory time of 20 minutes per hour for persons with benchmark disabilities
Paper IV Technical	Indian Sign Language Interpretation: □ Practical □ Personal Interview	200 (MCQ)	2 hours with compensatory time of 20 minutes per hour for persons with benchmark disabilities
Paper - III	**UNIT-I: Deaf, Deafness and Communication Options**	**Marks**	**Duration**
	1: Deafness and associated terminology 1.1 Concept of hearing loss 1.2 Misconcepts about deafness **2: Understanding the context** 2.1 Medical and Socio-cultural model: Meaning, global and Indian Scenario 2.2 Legislations, policies and practice in India **3: Meaning and Scope of Communication** 3.1 Meaning, definition and scope of communication 3.2 Communication challenges and sign language use **4: Communication: Modes and Options** 4.1 Oralism, Total Communication and Educational Bilingualism 4.2 Modes of linguistic communication (Aural/Oral, Visual/Manual, Visual/Graphical): Meaning and nature **5: Overview of Language** 5.1 Definition and design features of language and Indian Sign Language 5.2 Linguistic Theories and Sign	50	2 hours with compensatory time of 20 minutes per hour for persons with benchmark disabilities

	Languages		
	UNIT-II: Deaf Culture, History, Identity and Sign Language **1: History of deafness** 1.1 Historical development in the deaf community **2: Concept of Culture and the deaf communities** 2.1 Deaf culture in India and rest of the world: An overview **3: Concept of identity and the deaf** 3.1 The deaf identity and Deafhood: Problems and Issues **4: Sign Languages** 4.1 Sign Languages for education and literacy 4.2 Role and significance of technology for communication and learning **5: Deaf Community and Society** 5.1 Legal rights of the deaf 5.2 Participation of deaf people in education and other spheres	50	
	UNIT-III: Indian Sign Language Linguistics **1: Structure of ISL: Basic Components** 1.1 Introduction to Linguistics 1.2 Features of signs **2: Time and Space in ISL** 2.1 Representation of time in space 2.2 Indexing and Localization **3: Structure of ISL: Sentences** 3.1 Concept and types of a sentence 3.2 Word sign order 3.3 Transforming a sentence **4: Other Linguistic Aspects of ISL** 4.1 Features of conversations, texts and stories in ISL	50	

	4.2 Acquisition of sign languages and the critical period		
	<u>UNIT-IV: Interpretation – Principle, Practices and Ethics</u> **1: Interpreting: the Concept** 1.1 Interpreter and Interpreting 1.2 Role of Context in interpreting **2: Role and Responsibility of an Interpreter** 2.1 Role of an Interpreter 2.2 Responsibility and essential skills sets required in an interpreter **3: Code of Ethics** 3.1 Professionalism in SL interpreting 3.2 Code of Ethics **4: Interpreting in India** 4.1 Need for sign language interpreter license, CRE, renewal & cancellation of license, India and international scenario.	50	
Paper - IV	**<u>UNIT-I: Basic Communication</u>** **1: BASIC VISUAL EXPRESSIVE SKILLS** 1.1 Greetings and introductions 1.2 Simple Adjectives relating to emotions and feelings, colors and shapes using pictures 1.3 Pronouns and Nouns : Household, School, Community living (Explanation of pictures) 1.4 Basic direct communication and dialogues 1.5 Basic picture stories	80	2 hours with compensatory time of 20 minutes per hour for persons with benchmark disabilities

	2: BASIC COMMUNICATION SKILLS: Level 1 2.1 Verbs, Sentences 2.2 Kinship terms (Flowcharts) and Indexing 2.3 Body parts, Health and Ailments, Bahaviour norms 2.4 English Manual Alphabet (two-handed), Numbers and Numerals 2.5 Food, Profession and Work terms, Money, Measures 2.6 Calendar items, Time, Directions 2.7 Interrogatives **3: BASIC COMMUNICATION SKILLS: Level 2** 3.1 Negation 3.2 Festivals, Social Life 3.3 Nature, Weather, Animals 3.4 Location, Place names, Languages 3.5 Transportation **4: BASIC COMMUNICATION SKILLS: Simple technical terms** 4.1 Simple technical terms: School Subjects 4.2 Simple technical terms: Telecommunication 4.3 Simple technical terms: Government and Legal setup 4.4 Simple technical terms: Medical terms		
	<u>UNIT-II: Advanced Communication</u> **1: ADVANCED COMMUNICATION SKILLS** 1.1 English Manual Alphabet (one-handed) for deaf-blind 1.2 Degree of colour, size and shape, handling objects 1.3 Advanced level of picture description and picture stories 1.4 Dialogues and role play **2: ADVANCED COMMUNICATION SKILLS** 2.1 Signing abstract concepts 2.2 Location – spaces 2.3 Repeated, Alternating and Unrealized actions 2.4 Plural actions and objects	80	

	2.5 Expressing movement 2.6 Signing picture stories, jokes **3: ADVANCED COMMUNICATION SKILLS: Technical signs** 3.1 Technical terms: High school terms 3.2 Technical terms: Computer Science and ITI related signs 3.3 Technical terms: Commerce **4: ADVANCED COMMUNICATION SKILLS: Regional variations** 4.1 Mediation during interpreting 4.2 Regional variation and sign switching		
	<u>UNIT-III: Basic Interpretation</u> **1: LISTENING AND SIGNING COMPREHENSIVE SKILLS** 1.1 Listening comprehension 1.2 Signing comprehension **2: BASIC SKILLS** 2.1 Expressive skills (Spoken and sign language fluency) 2.2 Basic tactile interpreting for Deaf - Blind 2.3 Note – taking **3: INTERPRETING SKILLS (BASIC)** 3.1 Sign to voice: Short sentences, phrases and paragraphs 3.2 Voice to sign: Short sentences and phrases 3.3 Interpreting in a pre-primary/primary school setting 3.4 Interpreting TV News/Shows/Telephone	40	

Notes:

1) Questions shall be set in Objective Type Multiple Choice pattern only except for questions on General English under Paper-I. In other words, there shall be multiple probable answers (at least four) wherein candidates have to choose the correct answer for every objective type question.
2) Questions will be set in tune with the level of education qualification prescribed in the corresponding Recruitment Rules/Service Rules for the post(s).
3) A brief description of the syllabus for direct recruitment of Sign Language Interpreter is as follows:

Description of Syllabus

Paper – III

Indian Sign Language Interpretation (Theory): Questions relating to Deaf, Deafness and Communication Option, Deaf culture – History, Identity and Sign Language, Indian Sign Language linguistics and Interpretation – Principles, Practices and Ethics will be designed to test the candidate's knowledge of the subject.

Paper – IV

Indian Sign Language Interpretation (Practical): Questions relating to Basic communication, Advanced communication and Basic Interpretation will be designed to test the candidate's knowledge of the subject.

Personal Interview: Personal interview will be conducted to analyze/evaluate the behavior, attitude, motivations, body language and personalities of the candidate.

SYLLABUS ON PAPER III (TECHNICAL SUBJECT) FOR RECRUITMENT TO THE POST OF EXTENSION OFFICER (HANDLOOM, TEXTILE AND HANDICRAFT) UNDER COMMERCE & INDUSTRIES DEPARTMENT.

Paper-III	Weaving theory (WTTC) (25 Questions)	50 marks	2 hours with additional time of 40 minutes for PwBD candidates who are eligible for getting scribe.
	Textile calculation (WTTC) (10 questions)	20 marks	
	Chemical Processing/Dyeing (15 questions)	30 marks	
	Fabric structure (25 questions)	50 marks	
	Textile testing (25 questions)	50 marks	
	TOTAL	**200 marks**	