

Commission with a request to issue the correct e-Admission Certificate. Candidates may note that they will not be allowed to take the examination on the strength of an e-Admission Certificate issued in respect of another candidate.

(v) Candidates must ensure that their e-mail ids given in their applications are valid and active.

IMPORTANT: ALL COMMUNICATIONS TO THE COMMISSION SHOULD INvariably CONTAIN THE FOLLOWING PARTICULARS:
1. NAME AND YEAR OF THE EXAMINATION.
2. REGISTRATION ID (RID)
3. ROLL NO. (IF RECEIVED).
4. NAME OF CANDIDATE IN FULL AND IN BLOCK LETTERS.
5. VALID AND ACTIVE E-MAIL ADDRESS
6. COMPLETE POSTAL ADDRESS AS GIVEN IN THE APPLICATION.

N.B. (i) COMMUNICATIONS NOT CONTAINING THE ABOVE PARTICULARS MAY NOT BE ATTENDED TO.

N.B. (ii) IF A LETTER/COMMUNICATION IS RECEIVED FROM A CANDIDATE AFTER AN EXAMINATION HAS BEEN HELD AND IT DOES NOT GIVE HIS/HER FULL NAME AND ROLL NUMBER, IT WILL BE IGNORED AND NO ACTION WILL BE TAKEN THEREON.

N.B. (iii) Candidates are strongly advised to keep a printout or soft copy of their online application for future references.

8. Details of the categories/sub categories of disabilities (functional classification and Physical Requirements) identified for the various Services/posts:

*For being considered against the vacancies reserved for them, the physically disabled persons should have disability of forty per cent (40%) or more. The functional classification in their case shall be consistent with the requirements of the concerned services/posts as detailed in Annexure-I. However, such candidates shall be required to meet the physical requirements/abilities as detailed in Annexure-I.

Annexure-I

A List of Services/Posts identified suitable for Physically Disabled Category along with the Physical requirements and functional classifications*

Sl. No.	Name of Services	Functional Classification	Physical Requirement
Category I-Civil Engineering			
1.	Indian Railway Service of Engineers	OA or OL or HI	S, ST, BN W, SE, MF C,R,W&RW
2.	Indian Railway Stores Service	OA or OL or HI	S, ST, BN W, SE, MF C,R,W&RW
3.	Central Engineering Service	OA or OL or HI	As per MOSJ&E instructions
4.	Indian Defence Service of Engineers (Civil Engg.)	PD or OA	S, ST, BN W, SE, H&RW
5.	Indian Ordnance Factories Service (Civil Engg. Br.)	OA or PD	B, S, ST, W SE&H
6.	Central Engineering Service (Roads) Gr. A	Nil	Nil
7.	AEE in P&T Bldg. Works Gr. A	OA	MF, P, L, K C, BN, S, ST W, SE, H&RW B, S, ST, W SE, H&RW
8.	Assistant Executive Engineer (Civil) in Border Roads Organisation	OA	SE, H&RW
Category II-Mechanical Engineering			
1.	Indian Railway Service of Mechanical Engineers	OA or OL	S, ST, BN W SE, MF, C, R W&RW
2.	Indian Railway Stores service	OA or OL or HI	S, ST, BN W SE, MF, C, R W&RW
3.	Central Power Engg. Service Grade I (Mech. Engg. Posts)	OL	ST, S, SE, MF BN, KC, H&C
4.	Indian Ordnance Factories Service (Mech. Engg. Branch)	HI (PD) or OA or OL	B, SE, H&W
5.	Indian Naval Armament Service	OL	S, SE, H&RW
6.	Assistant Executive Engr. in the corps of EME	PD	F, P, L, K C, B, S, ST, W SE&RW S, SE, H&RW
7.	Asstt. Naval Store Officer in Indian Navy	OL	As per MOSJ&E instructions B, S, ST, W, SE, H& RW
8.	Central Elect. & Mech. Engg. Service	OL or HI	As per MOSJ&E instructions
9.	Indian Defence Service of Engineers (Mech. Engg.)	PD or OA	B, S, ST, W, SE, H& RW
10.	Central Engineering Service (Roads) Group 'A' (Mechanical Engg. Post)	Nil	Nil
11.	Assistant Executive Engineer (Mech.) in Border Roads Organisation	OA	B, S, ST, W, SE, H&RW

Category III-Electrical Engineering

1.	Indian Railway Service of Electrical Engineers	OA or OL or HI	S, ST, BN, W SE, MF, C, R W&RW
2.	Indian Railway Stores Service	OA or OL or HI	S, ST, BN, W SE, MF, C, R W&RW
3.	Central Elect & Mech. Engg. Service (Elect Engg.)	OL or HI	As per MOSJ&E instructions
4.	Indian Naval Armament Service	OL	S, SE, H& RW
5.	Indian Ordnance Factories Service (Elect.)	OL or PD	B, S, ST, W SE
6.	Central Power Engg. Service Grade I (Elect. Engg. Posts)	OL, HI	S, ST, BN, SE W, MF, P, L, KC, C, & RW
7.	Indian Defence Service of Engineers (Elect Engg.)	PD or OA	B, S, ST, B, W, SE, H & RW
8.	Asstt. Naval Store Officer in Indian Navy	OL	S, SE, H& RW
9.	AEE in P&T Bldg. Works Gr. 'A'	OA	MF, P, L, K, C, BN, S, ST

Category IV-Electronics & Tele communication Engineering

1.	Indian Railway Service of Signal Engineers	OA or OL	S, ST, BN, W SE, MF, C, R W&RW
2.	Indian Railway Stores Service	OA or OL or HI	S, ST, BN, W SE, MF, C, R W&RW
3.	Indian Ordnance Factories Service (E&T Engg. Branch)	OL or PD	B, ST, W & SE
4.	Indian Naval Armament Service	OL	S, SE, H& RW
5.	Asstt. Exe. Engineer in the corps of EME	PD or OA	S, ST, B, W, SE
6.	Indian Radio regulatory Service Group 'A'	OA or OL	S, H&RW/ Speaking
7.	Asstt. Naval Store Officer Gr.I	OL	S, SE, H& RW
8.	Indian Supply Service, (Group A) (Elec & Telecom)	OA or OL	MF, P, L, K, C, BN, S, ST W, R, W&C
9.	Indian Telecom Service, Group A	OL or OA or MW	F, S, ST, W, SE, H&RW
10.	Junior Telecom Officer Group B in ITS	OL or OA or MW	F, S, ST, W, SE, H&RW
11.	Central Power Engineering Service Grade I	OL, HI	S, ST, BN, SE W, MF, P, L, KC, C&RW

*The list is subject to revision.

The abbreviations used (indicated as below) are as per the specification in Ministry of Social Justice and Empowerment's Notification No. 16-70/2004-DDIII dated 18.01.2007

OA=One arm affected, OL = One Leg affected, HI=Hearing Impaired, PD=Partially Deaf, MW=Muscular Weakness S=Sitting, BN=Bending, SE=Seeing, RW=Reading & Writing, C=communication, MF=Manipulation by Fingers, PP=Pulling & Pushing, L=Lifting, KC=Kneeling & Crouching, ST=Standing, W=Walking, H=Hearing, OH=Orthopaedically Handicapped, LD=Locomotor Disability, CP=Cerebral Palsy.

9. WITHDRAWAL OF APPLICATIONS:

NO REQUEST FOR WITHDRAWAL OF CANDIDATURE RECEIVED FROM A CANDIDATE AFTER HE/SHE HAS SUBMITTED HIS/HER APPLICATION WILL BE ENTERTAINED UNDER ANY CIRCUMSTANCES.

(MALAY MUKHOPADHYAY)

DEPUTY SECRETARY

UNION PUBLIC SERVICE COMMISSION

APPENDIX-I

PLAN OF EXAMINATION

1. The Examination shall be conducted according to the following plan:-

Part I—The written Examination will comprise two sections—Section I consisting only of objective types of questions and Section II of conventional papers. Both Sections will cover the entire syllabus of the relevant engineering disciplines viz. Civil Engineering, Mechanical Engineering, Electrical Engineering and Electronics & Telecommunication Engineering. The standard and syllabi prescribed for these papers are given in Schedule to the Appendix. The details of the written Examination i.e. subject, duration and maximum marks allotted to each subject are given in para 2 below. Part II—Personality test carrying a maximum of 200 marks of such of the candidates who qualify on the basis of the written examination.

2. The following will be the subjects for the written examination:-

CATEGORY I

CIVIL ENGINEERING

Subject	Duration	Maximum Marks
Section I- Objective Papers		
General Ability Test (Part A: General English) (Part B: General Studies)	2 hrs.	200
Civil Engineering - Paper I	2 hrs.	200
Civil Engineering - Paper II	2 hrs.	200
Section II- Conventional Papers		
Civil Engineering - Paper I	3 hrs.	200
Civil Engineering - Paper II	3 hrs.	200
TOTAL		1000

CATEGORY II

MECHANICAL ENGINEERING

Subject	Duration	Maximum Marks
Section I- Objective Papers		
General Ability Test (Part A: General English) (Part B: General Studies)	2 hrs.	200
Mechanical Engineering - Paper I	2 hrs.	200
Mechanical Engineering - Paper II	2 hrs.	200
Section II- Conventional Papers		
Mechanical Engineering - Paper I	3 hrs.	200
Mechanical Engineering - Paper II	3 hrs.	200
TOTAL		1000

CATEGORY III

ELECTRICAL ENGINEERING

Subject	Duration	Maximum Marks
Section I- Objective Papers		
General Ability Test (Part A: General English) (Part B: General Studies)	2 hrs.	200
Electrical Engineering - Paper I	2 hrs.	200
Electrical Engineering - Paper II	2 hrs.	200
Section II- Conventional Papers		
Electrical Engineering - Paper I	3 hrs.	200
Electrical Engineering - Paper II	3 hrs.	200
TOTAL		1000

CATEGORY IV

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Subject	Duration	Maximum Marks
Section I- Objective Papers		
General Ability Test (Part A: General English) (Part B: General Studies)	2 hrs.	200
Electronics & Telecommunication Engineering - Paper I	2 hrs.	200
Electronics & Telecommunication Engineering - Paper II	2 hrs.	200
Section II- Conventional Papers		
Electronics & Telecommunication Engineering - Paper I	3 hrs.	200
Electronics & Telecommunication Engineering - Paper II	3 hrs.	200
TOTAL		1000

NOTE: Candidates are advised to read carefully special instructions to candidates for conventional type tests and objective type tests given in Appendix-III (Part A & Part B) including the procedure regarding filling in the Answer Sheet of objective type tests in the Examination Hall.

3. In the Personality Test special attention will be paid to assessing the candidate's capacity for leadership, initiative and intellectual curiosity, tact and other social qualities, mental and physical energy, powers of practical application and integrity of character.

4. Conventional papers must be answered in English. Question papers will be set in English only.

5. Candidates must write the papers in their own hand. In no circumstances will they be allowed the help of a scribe to write the answers for them. However, an extra time of twenty minutes per hour shall be permitted for the candidates with locomotor disability/cerebral palsy where dominant (writing) extremity is affected to the extent of slowing the performance of function (minimum of 40% impairment) in the conventional type paper.

6. The Commission have discretion to fix minimum qualifying marks in any or all the papers of the examination. The Objective Type papers as contained in Section-I of the Plan of the Examination will be evaluated first and evaluation

of the Conventional Type Papers contained in Section-II of the Plan of Examination will be done only of those candidates who obtain the minimum qualifying marks in Objective Types Papers, as fixed by the Commission.

7. Marks will not be allotted for mere superficial knowledge.

8. Deduction upto 5 per cent of the maximum marks for the written papers will be made for illegible handwriting.

9. Credit will be given for orderly, effective and exact expression combined with due economy of words in the conventional papers of the Examination.

10. In the question papers, wherever required, SI units will be used.

NOTE: Candidates will be supplied with standard tables/charts in SI units in the Examination hall for reference purpose, wherever considered necessary.

11. Candidates are permitted to bring and use battery operated pocket calculators for conventional (essay) type papers only. Loaning or inter-changing of calculators in the Examination hall is not permitted.

It is also important to note that candidates are not permitted to use calculators for answering Objective Type Paper (Test booklets). They should not, therefore, bring the same inside the Examination Hall.

12. Candidates should use only International form of Indian numerals (e.g. 1,2,3,4,5,6 etc.) while answering question papers.

SCHEDULE TO APPENDIX-I

Standard and Syllabi

The standard of paper in General Ability Test will be such as may be expected of an Engineering/Science Graduate. The standard of papers in other subjects will approximately be that of an Engineering Degree Examination of an Indian University. There will be no practical examination in any of the subjects.

GENERAL ABILITY TEST

Part A: General English. The question paper in General English will be designed to test the candidate's understanding of English and workmanlike use of words.

Part B: General Studies: The paper in General Studies will include knowledge of current events and of such matters as of everyday observation and experience in their scientific aspects as may be expected of an educated person. The paper will also include questions on History of India and Geography of a nature which candidates should be able to answer without special study.

CIVIL ENGINEERING

(For both objective and conventional type papers)

PAPER-I

- BUILDING MATERIALS**
Timber: Different types and species of structural timber, density-moisture relationship, strength in different directions, defects, influence of defects on permissible stress, preservation, dry and wet rots, codal provisions for design, plywood.
Bricks: Types, Indian Standard classification, absorption, saturation factor, strength in masonry, influence of mortar strength on masonry strength.
Cement: Compounds of, different types, setting times, strength. Cement Mortar: Ingredients, proportions, water demand, mortars for plastering and masonry.
Concrete: Importance of W/C Ratio, Strength, ingredients including admixtures, workability, testing for strength, elasticity, non-destructive testing, mix design methods.
- SOLID MECHANICS**
Elastic constants, stress, plane stress, Mohr's circle of stress, strains, plane strain, Mohr's circle of strain, combined stress; Elastic theories of failure; Simple bending, shear; Torsion of circular and rectangular sections and simple members.
- STRUCTURAL ANALYSIS**
Analysis of determinate structures - different methods including graphical methods. Analysis of indeterminate skeletal frames - moment distribution, slope-deflection, stiffness and force methods, energy methods, Muller-Breslau principle and application. Plastic analysis of indeterminate beams and simple frames - shape factors.
- DESIGN OF STEEL STRUCTURES**
Principles of working stress method. Design of connections, simple members, Built-up sections and frames, Design of Industrial roofs. Principles of ultimate load design. Design of simple members and frames.
- DESIGN OF CONCRETE AND MASONRY STRUCTURES**
Limit state design for bending, shear, axial compression and combined forces. Codal provisions for slabs, beams, walls and footings. Working stress method of design of R.C. members.
Principles of prestressed concrete design, materials, methods of prestressing

Continued

losses. Design of simple members and determinate structures. Introductions to prestressing of indeterminate structures.

Design of brick masonry as per I.S. Codes.

6. CONSTRUCTION PRACTICE, PLANNING AND MANAGEMENT

Concreting Equipment:

Weight Batcher, Mixer, vibrator, batching plant, concrete pump.

Cranes, hoists, lifting equipment.

Earthwork Equipment :

Power shovel, hoe, dozer, dumper, trailers and tractor, rollers, sheep foot rollers, pumps.

Construction, Planning and Management :

Bar chart, linked bar chart, work-break down structures, Activity - on - arrow diagrams. Critical path, probabilistic activity durations; Event-based networks. PERT network: Time-cost study, crashing; Resource allocation.

PAPER-II

1. (a) FLUID MECHANICS, OPEN CHANNEL FLOW, PIPE FLOW

Fluid Properties, Pressure, Thrust, Buoyancy; Flow Kinematics; Integration of flow equations; Flow measurement; Relative motion; Moment of momentum; Viscosity, Boundary layer and Control, Drag, Lift; dimensional Analysis, Modelling; Cavitation; Flow oscillations; Momentum and Energy principles in Open channel flow, Flow controls, Hydraulic jump, Flow sections and properties; Normal flow, Gradually varied flow; Surges; Flow development and losses in pipe flows, Measurements; Siphons; Surges and Water hammer; Delivery of Power Pipe networks.

(b) HYDRAULIC MACHINES AND HYDROPOWER

Centrifugal pumps, types, performance parameters, scaling, pumps in parallel; Reciprocating pumps, air vessels, performance parameters; Hydraulic ram; Hydraulic turbines, types, performance parameters, controls, choice; Power house, classification and layout, storage, pondage, control of supply.

2. (a) HYDROLOGY

Hydrological cycle, precipitation and related data analyses, PMP, unit and synthetic hydrographs; Evaporation and transpiration; Floods and their management, PMF; Streams and their gauging; River morphology; Routing of floods; Capacity of Reservoirs.

(b) WATER RESOURCES ENGINEERING

Water resources of the globe: Multi-purpose uses of Water: Soil-Plant-Water relationships, irrigation systems, water demand assessment; Storages and their yields, ground water yield and well hydraulics; Waterlogging, drainage design; Irrigation revenue; Design of rigid boundary canals, Lacey's and Tractive force concepts in canal design, lining of canals; Sediment transport in canals; Non-Overflow and overflow sections of gravity dams and their design, Energy dissipators and tailwater rating; Design of headworks, distribution works, falls, cross-drainage works, outlets; River training.

3. ENVIRONMENTAL ENGINEERING

(a) WATER SUPPLY ENGINEERING

Sources of supply, yields, design of intakes and conductors; Estimation of demand; Water quality standards; Control of Water-borne diseases; Primary and secondary treatment, detailing and maintenance of treatment units; Conveyance of treatment units; Conveyance and distribution systems of treated water, leakages and control; Rural water supply; Institutional and industrial water supply.

(b) WASTE WATER ENGINEERING

Urban rain water disposal; Systems of sewage collection and disposal; Design of sewers and sewerage systems; pumping; Characteristics of sewage

and its treatment, Disposal of products of sewage treatment, streamflow rejuvenation Institutional and industrial sewage management; Plumbing Systems; Rural and semi-urban sanitation.

(c) SOLID WASTE MANAGEMENT

Source, classification collection and disposal; Design and Management of landfills.

(d) AIR AND NOISE POLLUTION AND ECOLOGY

Sources and effects of air pollution, monitoring of air pollution; Noise pollution and standards; Ecological chain and balance, Environmental assessment.

4. (a) SOIL MECHANICS

Properties of soil, classification and interrelationship; Compaction behaviour, methods of compaction and their choice; Permeability and seepage, flow nets, Inverted filters; Compressibility and consolidation; Shearing resistance, stresses and failure; soil testing in laboratory and in-situ; Stress path and applications; Earth pressure theories, stress distribution in soil; soil exploration, samplers, load tests, penetration tests.

(b) FOUNDATION ENGINEERING

Types of foundations, Selection criteria, bearing capacity, settlement, laboratory and field tests; Types of piles and their design and layout, Foundations on expansive soils, swelling and its prevention, foundation on swelling soils.

5. (a) SURVEYING

Classification of surveys, scales, accuracy; Measurement of distances - direct and indirect methods; optical and electronic devices; Measurement of directions, prismatic compass, local attraction; Theodolites - types; Measurement of elevations - Spirit and trigonometric levelling; Relief representation; Contours; Digital elevation modelling concept; Establishment of control by triangulations and traversing - measurements and adjustment of observations, computation of coordinates; Field astronomy, Concept of global positioning system; Map preparation by plane tabling and by photogrammetry; Remote sensing concepts, map substitutes.

(b) TRANSPORTATION ENGINEERING

Planning of highway systems, alignment and geometric design, horizontal and vertical curves, grade separation; Materials and construction methods for different surfaces and maintenance; Principles of pavement design; Drainage.

Traffic surveys, Intersections, signalling; Mass transit systems, accessibility, networking.

Tunnelling, alignment, methods of construction, disposal of muck, drainage, lighting and ventilation, traffic control, emergency management.

Planning of railway systems, terminology and designs, relating to gauge, track, controls, transits, rolling stock, tractive power and track modernisation; Maintenance; Appurtenant works; Containerisation.

Harbours - layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses.

Airports - layout and orientation; Runway and taxiway design and drainage management; Zoning laws; Visual aids and air traffic control; Helipads, hangars, service equipment.

MECHANICAL ENGINEERING

(For both objective and conventional type papers)

PAPER-I

1. Thermodynamics, Cycles and IC Engines: Basic concepts, Open and Closed systems. Heat and work. Ze-

roth, First and Second Law, Application to non-Flow and Flow processors. Entropy, Availability, Irreversibility and Tds relations. Claperyron and real gas equations, Properties of ideal gases and vapours. Standard vapour, Gas power and Refrigeration cycles. Two stage compressor. C-I and S.I. Engines. Pre-ignition, Detonation and Diesel-knock, Fuel injection and Carburation, Supercharging. Turbo-prop and Rocket engines, Engine Cooling, Emission & Control, Flue gas analysis, Measurement of Calorific values. Conventional and Nuclear fuels, Elements of Nuclear power production.

2. Heat Transfer and Refrigeration and Airconditioning: Modes of heat transfer. One dimensional steady and unsteady conduction. Composite slab and Equivalent Resistance. Heat dissipation from extended surfaces, Heat exchangers, Overall heat transfer coefficient, Empirical correlations for heat transfer in laminar and turbulent flows and for free and forced Convection, Thermal boundary layer over a flat plate. Fundamentals of diffusive and connective mass transfer, Black body and basic concepts in Radiation, Enclosure theory, Shape factor, Net work analysis. Heat pump and Refrigeration cycles and systems, Refrigerants. Condensers, Evaporates and Expansion devices, Psychrometry, Charts and application to air conditioning, Sensible heating and cooling, Effective temperature, comfort indices, Load calculations, Solar refrigerations, controls, Duct design.

3. Fluid Mechanics.

Properties and classification of fluids, Manometry, forces on immersed surfaces, Center of pressure, Buoyancy, Elements of stability of floating bodies. Kinematics and Dynamics. Irrotational and incompressible. Inviscid flow. Velocity potential, Pressure field and Forces on immersed bodies. Bernoulli's equation, Fully developed flow through pipes, Pressure drop calculations, Measurement of flow rate and Pressure drop. Elements of boundary layer theory, Integral approach, Laminar and turbulent flows, Separations. Flow over weirs and notches. Open channel flow, Hydraulic jump. Dimensionless numbers, Dimensional analysis, Similitude and modelling. One-dimensional isentropic flow, Normal shock wave, Flow through convergent - divergent ducts, Oblique shock-wave, Rayleigh and Fanno lines.

4. Fluid Machinery and Steam Generators.

Performance, Operation and control of hydraulic Pump and impulse reaction Turbines, Specific speed, Classification. Energy transfer, Coupling, Power transmission, Steam generators Fire-tube and water-tube boilers. Flow of steam through Nozzles and Diffusers, Wetness and condensation. Various types of steam and gas Turbines, Velocity diagrams. Partial admission. Reciprocating, Centrifugal and axial flow Compressors, Multistage compression, role of Mach Number, Reheat, Regeneration, Efficiency, Governance.

5. THEORY OF MACHINES

Kinematic and dynamic analysis of planer mechanisms. Cams. Gears and gear trains. Flywheels. Governors. Balancing of rigid rotors and field balancing. Balancing of single and multicylinder engines, Linear vibration analysis of mechanical systems. Critical speeds and whirling of shafts Automatic controls.

PAPER - II

6. MACHINE DESIGN

Design of Joints : cotters, keys, splines, welded joints, threaded fasteners, joints formed by interference fits. Design of friction drives : couplings and clutches, belt and chain drives, power screws.

Design of Power transmission systems : gears and gear drives shaft and axle, wire ropes.

Design of bearings : hydrodynamics bearings and rolling element bearings.

7. STRENGTH OF MATERIALS

Stress and strain in two dimensions, Principal stresses and strains, Mohr's construction, linear elastic materials, isotropy and anisotropy, stress-strain relations, uniaxial loading, thermal stresses. Beams : Bending moment and shear force diagram, bending stresses and deflection of beams. Shear stress distribution. Torsion of shafts, helical springs. Combined stresses, thick-and thin-walled pressure vessels. Struts and columns. Strain energy concepts and theories of failure.

8. ENGINEERING MATERIALS

Basic concepts on structure of solids. Crystalline materials. Defects in crystalline materials. Alloys and binary phase diagrams. Structure and properties of common engineering materials. Heat treatment of steels. Plastics, Ceramics and composite materials. Common applications of various materials.

9. PRODUCTION ENGINEERING

Metal Forming : Basic Principles of forging, drawing and extrusion; High energy rate forming; Powder metallurgy. **Metal Casting** : Die casting, investment casting, Shell Moulding, Centrifugal Casting, Gating & Riser design; melting furnaces.

Fabrication Processes : Principles of Gas, Arc, Shielded arc Welding; Advanced Welding Processes, Weldability; Metallurgy of Welding.

Metal Cutting : Turning, Methods of Screw Production, Drilling, Boring, Milling, Gear Manufacturing, Production of flat surfaces, Grinding & Finishing Processes. Computer Controlled Manufacturing Systems-CNC, DNC, FMS, Automation and Robotics.

Cutting Tools Materials, Tool Geometry, Mechanism of Tool Wear, Tool Life & Machinability; Measurement of cutting forces. Economics of Machining. Unconventional Machining Processes. Jigs and Fixtures. Fits and tolerances, Measurement of surface texture, Comparators Alignment tests and reconditioning of Machine Tools.

10. INDUSTRIAL ENGINEERING

Production Planning and Control : Forecasting - Moving average, exponential smoothing, Operations, scheduling; assembly line balancing, Product development, Break-even analysis, Capacity planning, PERT and CPM.

Control Operations : Inventory control ABC analysis, EOQ model, Materials requirement planning. Job design, Job standards, Work measurement, Quality Management - Quality analysis and control. Operations Research : Linear Programming - Graphical and Simplex methods, Transportation and assignment models. Single server queueing model.

Value Engineering : Value analysis for cost/value.

11. ELEMENTS OF COMPUTATION

Computer Organisation, Flow charting, Features of Common computer Languages - FORTRAN, d Base III, Lotus 1-2-3, C and elementary Programming.

ELECTRICAL ENGINEERING

(For both objective and conventional types papers)

PAPER - I

1. EM Theory

Electric and magnetic fields. Gauss's

Continued

Law and Amperes Law. Fields in dielectrics, conductors and magnetic materials. Maxwell's equations. Time varying fields. Plane-Wave propagating in dielectric and conducting media. Transmission lines.

2. Electrical Materials

Band Theory, Conductors, Semi-conductors and Insulators. Super-conductivity. Insulators for electrical and electronic applications. Magnetic materials. Ferro and ferri magnetism. Ceramics, Properties and applications. Hall effect and its applications. Special semi conductors.

3. Electrical Circuits

Circuits elements. Kirchoff's Laws. Mesh and nodal analysis. Network Theorems and applications. Natural response and forced response. Transient response and steady state response for arbitrary inputs. Properties of networks in terms of poles and zeros. Transfer function. Resonant circuits. Three-phase circuits. Two-port networks. Elements of two-element network synthesis.

4. Measurements and Instrumentation

Units and Standards. Error analysis, measurement of current, Voltage, power, Power-factor and energy. Indicating instruments. Measurement of resistance, inductance, Capacitance and frequency. Bridge measurements. Electronic measuring instruments. Digital Voltmeter and frequency counter. Transducers and their applications to the measurement of non-electrical quantities like temperature, pressure, flow-rate displacement, acceleration, noise level etc. Data acquisition systems. A/D and D/A converters.

5. CONTROL SYSTEMS

Mathematical modelling of physical systems. Block diagrams and signal flow graphs and their reduction. Time domain and frequency domain analysis of linear dynamical system. Errors for different type of inputs and stability criteria for feedback systems. Stability analysis using Routh-Hurwitz array, Nyquist plot and Bode plot. Root locus and Nicols chart and the estimation of gain and phase margin. Basic concepts of compensator design. State variable matrix design. Sampled data system and performance of such a system with the samples in the error channel. Stability of sampled data system. Elements of non-linear control analysis. Control system components, electromechanical, hydraulic, pneumatic components.

PAPER - II

1. Electrical Machines and Power Transformers

Magnetic Circuits - Analysis and Design of Power transformers. Construction and testing. Equivalent circuits. Losses and efficiency. Regulation. Auto-transformer, 3-phase transformer. Parallel operation. Basic concepts in rotating machines. EMF, torque, basic machine types. Construction and operation, leakage losses and efficiency. D.C. Machines. Construction, Excitation methods. Circuit models. Armature reaction and commutation. Characteristics and performance analysis. Generators and motors. Starting and speed control. Testing, Losses and efficiency.

Synchronous Machines. Construction. Circuit model. Operating characteristics and performance analysis. Synchronous reactance. Efficiency. Voltage regulation. Salient-pole machine, Parallel operation. Hunting. Short circuit transients. Induction Machines. Construction. Principle of operation. Rotating fields. Characteristics and performance analysis. Determination of circuit model. Circle diagram. Starting and speed control. Fractional KW motors. Single-phase synchronous and induction motors.

2. Power systems

Types of Power Stations, Hydro, Thermal and Nuclear Stations. Pumped storage plants. Economics and operating factors.

Power transmission lines. Modeling and performance characteristics. Voltage control. Load flow studies. Optimal power system operation. Load frequency control. Symmetrical short circuit analysis. Z-Bus formulation. Symmetrical Components. Per Unit representation. Fault analysis. Transient and steady-state stability of power systems. Equal area criterion. Power system Transients. Power system Protection Circuit breakers. Relays. HVDC transmission.

3. ANALOG AND DIGITAL ELECTRONICS AND CIRCUITS

Semiconductor device physics, PN junctions and transistors, circuit models and parameters, FET, Zener, tunnel, Schottky, photo diodes and their applications, rectifier circuits, voltage regulators and multipliers, switching behavior of diodes and transistors. Small signal amplifiers, biasing circuits, frequency response and improvement, multistage amplifiers and feedback amplifiers, D.C. amplifiers, coupling methods, push pull amplifiers, operational amplifiers, wave shaping circuits. Multivibrators and flip-flops and their applications. Digital logic gate families, universal gates-combinational circuits for arithmetic and logic operational, sequential logic circuits. Counters, registers, RAM and ROMs.

4. MICROPROCESSORS

Microprocessor architecture-Instruction set and simple assembly language programming. Interfacing for memory and I/O. Applications of Micro-processors in power system.

5. COMMUNICATION SYSTEMS

Types of modulation; AM, FM and PM. Demodulators. Noise and bandwidth considerations. Digital communication systems. Pulse code modulation and demodulation. Elements of sound and vision broadcasting. Carrier communication. Frequency division and time division multiplexing. Telemetry system in power engineering.

6. POWER ELECTRONICS

Power Semiconductor devices. Thyristor. Power transistor, GTOs and MOSFETs. Characteristics and operation. AC to DC Converters; 1-phase and 3-phase DC to DC Converters. AC regulators. Thyristor controlled rectifiers; switched capacitor networks. Inverters; single-phase and 3-phase. Pulse width modulation. Sinusoidal modulation with uniform sampling. Switched mode power supplies.

ELECTRONICS & TELECOMMUNICATION ENGINEERING

(For both objective and conventional type papers)

PAPER - I

1. Materials and Components

Structure and properties of Electrical Engineering materials; Conductors, Semiconductors and Insulators, magnetic, Ferroelectric, Piezoelectric, Ceramic, Optical and Super-conducting materials. Passive components and characteristics Resistors, Capacitors and Inductors; Ferrites, Quartz crystal Ceramic resonators, Electromagnetic an Electromechanical components.

2. Physical Electronics, Electron Devices and ICs

Electrons and holes in semiconductors, Carrier Statistics, Mechanism of current flow in a semiconductor, Hall effect; Junction theory; Different types of diodes and their characteristics; Bipolar Junction transistor; Field effect transistors; Power switching devices like SCRs, CTOs, power MOSFETs; Basics of ICs - bipolar, MOS and CMOS types; basic of Opto Electronics.

3. Signals and Systems

Classification of signals and systems; System modelling in terms of differ-

tial and difference equations; State variable representation; Fourier series; Fourier representation; Fourier series; Fourier transforms and their application to system analysis; Laplace transforms and their application to system analysis; Convolution and superposition integrals and their applications; Z-transforms and their applications to the analysis and characterisation of discrete time systems; Random signals and probability, Correlation functions; Spectral density; Response of linear system to random inputs.

4. Network theory

Network analysis techniques; Network theorems, transient response, steady state sinusoidal response; Network graphs and their applications in network analysis; Tellegen's theorem. Two port networks; Z, Y, h and transmission parameters. Combination of two ports, analysis of common two ports. Network functions: parts of network functions, obtaining a network function from a given part. Transmission criteria: delay and rise time, Elmore's and other definitions effect of cascading. Elements of network synthesis.

5. Electromagnetic Theory

Analysis of electrostatic and magnetostatic fields; Laplace's and Poisson's equations; Boundary value problems and their solutions; Maxwell's equations; application to wave propagation in bounded and unbounded media; Transmission lines: basic theory, standing waves, matching applications, misconstrue lines; Basics of wave guides and resonators; Elements of antenna theory.

6. Electronic Measurements and instrumentation

Basic concepts, standards and error analysis; Measurements of basic electrical quantities and parameters; Electronic measuring instruments and their principles of working: analog and digital, comparison, characteristics, application. Transducers; Electronic measurements of non electrical quantities like temperature, pressure, humidity etc; basics of telemetry for industrial use.

PAPER - II

1. Analog Electronic Circuits

Transistor biasing and stabilization. Small signal analysis. Power amplifiers. Frequency response. Wide banding techniques. Feedback amplifiers. Tuned amplifiers. Oscillators. Rectifiers and power supplies. Op Amp PLL, other linear integrated circuits and applications. Pulse shaping circuits and waveform generators.

2. Digital Electronic Circuits

Transistor as a switching element; Boolean algebra, simplification of Boolean functions, 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; Multiplexer Demultiplexer; ROM and their applications. Flip flops. R-S, J-K, D and T flip-flops; Different types of counters and registers Waveform generators. A/D and D/A converters. Semiconductor memories.

3. Control Systems

Transient and steady state response of control systems; Effect of feedback on stability and sensitivity; Root locus techniques; Frequency response analysis. Concepts of gain and phase margins: Constant-M and Constant-N Nichol's Chart; Approximation of transient response from Constant-N Nichol's Chart; Approximation of transient response from closed loop frequency response; Design of Control Systems, Compensators; Industrial controllers.

4. Communication Systems

Basic information theory; Modulation and detection in analogue and digital systems; Sampling and data reconstructions; Quantization & coding; Time division and frequency division multiplexing; Equalization; Optical Communication: in free space & fiber optic; Propagation of signals at HF, VHF, UHF and microwave frequency; Satellite Communication.

5. Microwave Engineering

Microwave Tubes and solid state devices, Microwave generation and amplifiers, Waveguides and other Microwave Components and Circuits, Misconstrue circuits, Microwave Antennas, Microwave Measurements, Masers, lasers; Microwave propagation. Microwave Communication Systems terrestrial and Satellite based.

6. Computer Engineering

Number Systems. Data representation; Programming; Elements of a high level programming language PASCAL/C; Use of basic data structures; Fundamentals of computer architecture; Processor design; Control unit design; Memory organisation, I/O System Organisation. Microprocessors: Architecture and instruction set of Microprocessors 8085 and 8086, Assembly language Programming, Microprocessor Based system design: typical examples. Personal computers and their typical uses.

Appendix-II

INSTRUCTIONS TO THE CANDIDATES FOR FILLING ONLINE APPLICATIONS

Candidates must apply online by using the website www.upsconline.nic.in. Salient Features of the system of Online Application Form are given hereunder:

- Detailed instructions for filling up Online Applications are available on the above mentioned website.
- Candidates will be required to complete the Online Application Form containing two stages viz. Part-I and Part-II as per the instructions available in the above mentioned site through drop down menu.
- The candidates are required to pay a fee of Rs. 200/- (Rupees Two Hundred Only) [excepting SC/ST/Female/PH candidates who are exempted from payment of fee] either by remitting the money in any branch of SBI by cash or by using net banking facility of State Bank of India/State Bank of Bikaner & Jaipur/State Bank of Hyderabad/State Bank of Mysore/State Bank of Patiala/State Bank of Travancore or by using any Visa/Master Credit/Debit Card.
- Before start filling up Online Application, a candidate must have his/her photograph and signature duly scanned in the .jpg format in such a manner that each file should not exceed 40 KB and must not be less than 3 KB in size for the photograph and 1 KB for the signature.
- The Online Applications (Part I and II) can be filled from **22nd March, 2014 to 21st April, 2014 till 11.59 p.m.**, after which link will be disabled.
- Applicants should avoid submitting multiple applications. However, if due to any unavoidable circumstances any applicant submits multiple applications then he must ensure that the applications with higher RID is complete in all respects.
- In case of multiple applications, the applications with higher RID shall be entertained by the Commission and fee paid against one RID shall not be adjusted against any other RID.
- The applicants must ensure that while filling their application form, they are providing their valid and active E-mail IDs as the Commission may use electronic mode of communication while contacting them.
- The Applicants are advised to check their emails at regular intervals and ensure that the email address ending with@nic.in are directed to their inbox folder and not to the SPAM folder or any other folder.
- Candidates are strongly advised to apply Online well in time without waiting for the last date for submission of Online Application.