

**Scheme and Syllabus for the Recruitment of Junior Telecom Officers(Telecom)**

For Direct Recruitment of Junior Telecom Officers, an objective type Examination of 3 hours duration consisting of following sectional papers will be conducted:

**SCHEME**

- A. Engineering Stream Section - I
- B. Engineering Stream Section - II
- C. General Ability Test Section - III

- 1. The standard of paper in Engineering subjects will be that of Engineering Degree Examination of an Indian University.
- 2. In the general ability test, special attention will be paid to assess the candidate's capacity for general awareness. The standard of paper in general ability test will be such as may be expected of an Engineering Graduate.
- 3. The syllabus for engineering stream papers will be as given below.

**SYLLABUS**

**SECTION - I**

**1. Materials and components**

Structure and properties of Electronic Engineering materials, Conductors, Semiconductors and Insulators, Magnetic, Ferroelectric, Piezoelectric, Ceramic, Optical and Superconducting materials. Passive components and characteristics, Resistors, Capacitors and Inductors; Ferrites, Quartz crystal, Ceramic resonators, Electromagnetic and Electromechanical components.

**2. Physical Electronics, Electronic Devices and ICs**

Electrons and holes in semiconductors, Carrier Statistics, Mechanics of current flow in a semi-conductor, 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; Basics of Opto Electronics.

**3. Network theory** Network analysis techniques: Network theorem, transient and steady state sinusoidal response, Transmission criteria: delay and rise time Elmore's and other definition, effect of cascading. Elements of network synthesis.

#### **4. Electromagnetic Theory**

Transmission lines: basic theory, standing waves, matching applications, microstrip lines; Basics of waveguides and resonators; Elements of antenna theory.

#### **5. 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, applications. Transducers; Electronic measurements of non-electrical quantities like temperature, pressure, humidity etc. Basics of telemetry for industrial use.

#### **6. Power Electronics**

Power Semiconductor devices, Thyristor, Power transistor, MOSFETs, Characteristics and operation. AC to DC convertors; 1-Phase and 3-phase DC to DC Convertors. AC regulators. Thyristor controlled reactors, switched capacitor networks. Inverters: Single-phase and 3-phase. Pulse width modulation. Sinusoidal modulation with uniform sampling. Switched mode power supplies.

### **SECTION-II**

#### **1. Analog Electronic Circuits**

Transistor biasing and stabilization, Small Signal analysis. Power amplifiers. Frequency response, Wide band techniques, Feedback amplifiers. Tuned amplifiers. Oscillators. Rectifiers and power supplies. Operational Amplifier, 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 convertors. 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 reconstruction. Quantization & Coding; Time division and frequency division multiplexing; Equalisation; Optical Communication: in free space & fibre 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, Microstrip 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 organization. I/O System Organization. Personal computers and their typical uses.

#### **7. Microprocessors**

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

### **SECTION-III**

#### **General ability test**

The candidate's comprehension and understanding of General English shall be tested through simple exercises. Questions on knowledge of current events and of such matter of everyday observation and experience in their scientific aspects as may be expected of an educated person. Questions will also be included on events and developments in Telecommunications, History of India and Geography. These will be of a nature, which can be answered without special study by an educated person.

**Scheme and Syllabus for the Recruitment of Junior Telecom Officers(Civil)**

For Direct Recruitment of Junior Telecom Officer(Civil), an objective type Examination of 3 hours duration consisting of following sectional papers will be conducted:

**SCHEME**

- A. Civil Engineering Stream Section - I : 50 questions
- B. Civil Engineering Stream Section - II : 50 questions
- C. General Ability Test Section - III : 20 questions

1. The standard of paper in Engineering subjects will be that of Engineering Degree Examination of Indian University.
2. In the general ability test, special attention will be paid to assess the candidate's capacity for general awareness. The standard of paper in general ability test will be such as may be expected of an Engineering Graduate.
3. The syllabus for Civil Engineering stream paper will be as given below.

**SYLLABUS:**

**SECTION-I - CIVIL ENGINEERING STREAM**

**1. BUILDING MATERIAL:**

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, plywood, codal provision for design.

Bricks: Types, Indian standard classification, absorption, saturation factor, strength in masonry, influence of mortar strength and masonry strength.

Cement: Compounds, different types, setting times, strength.

Cement Mortar: Ingredients, proportions, water demands, mortar for plastering and masonry.

Concrete: Importance of W/C ratio, strength, ingredients including admixtures, workability, testing, elasticity, non-destructive testing mix design method.

**2. SOLID MECHANICS**

Elastic constants, stress, plane stress, Mohr's circle of stress, strains, plain strain, Mohr's circle of strain, combined stress. Elastic theories of Failure, simple and shear bending, Torsion of circular and rectangular section and simple members.

### **3. 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.

### **4. DESIGN OF STEEL STRUCTURES**

Principle of working stress method. Design of connections of simple members. Built up sections and frames. Design of Industrial roofs. Principles of ultimate load design. Design of members and frames.

### **5. DESIGN OF CONCRETE AND MASONRY STRUCTURES.**

Limit state design for bending, shear, axial compression and combined forces, Code provisions for slabs, beams, walls and footings. Working stress method of design of R.C. members.

Principles of prestressed concrete design, material, method of prestressing 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 tractors, 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.

## **SECTION-II - CIVIL ENGINEERING STREAM**

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

Fluid properties, pressure, thrust, Buoyancy, Flow Kinematics, integration, of flow equation, Flow measurement, Relative motion, Moment of momentum, Viscosity, Boundary layer and control, Drag, Lift, Dimensional analysis, Modeling, Cavitations, Flow oscillations, Momentum and Energy principles, in open channel flow, Flow control, Hydraulic jump, Flow section and properties, Normal flow, Gradually varied flow, 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, performance parameters, scaling, pumps in parallel, Reciprocating pumps, air vessels, performance parameters;

### **2. (a) HYDROLOGY:**

Hydrological cycle, precipitation and related data analysis, PMP, unit and synthetic hydrographs, Evaporation and transpiration, floods and their management, PMG, Streams and their gauging, .River morphology. Routing of floods, Capacity of reservoirs.

### **(b) WATER RESOURCES ENGINEERING:**

Water resources of the globe: Multipurpose uses of Water, Soil Plant water relationships, irrigation systems, water demand assessment, Storage and their yields, ground water yield and well Hydraulics, Water logging, drainage design, Irrigation revenue, Design of rigid boundary canals, Lacey' 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 dissipaters and tail water rating, Design of head works, distribution work, falls, cross-drainage work, outlets, River training.

## **ENVIRONMENT ENGINEERING**

### **3. (a)WATER SUPPLY ENGINEERING.**

Sources of supply, yield, design of intakes and conductors, Estimation of demand, Water quality standards, Control of water born diseases. Primary and secondary treatment, detailing and maintenance of treatment units. Conveyance and distribution systems of treated water, leakage and control, Rural water supply, Institutional and Industrial water supply.

### **(b) WASTE WATER ENGINEERING**

Urban rain water disposal, system of sewage collection and disposal, Design of sewers and sewerages systems, pumping, Characteristic of sewage and its treatment, Disposal of products of sewage treatment, stream flow rejuvenation, Institutional and industrial sewage management, plumbing system, Rural and semi-urban sanitation.

**( c) SOLID WASTE MANAGEMENT**

Sources, 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 soils, classification and interrelationship, Compaction behavior, method of compaction and their choice, Permeability and seepage, flow nets, Inverter filters, Compressibility and consolidation ,shearing resistance, stresses and failure, SO 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**

Type of foundations, Selection criteria, bearing capacity, settlement, laboratory and field test, Types of piles and their design and layout, Foundations on expansive soils, swelling and it 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 Measurment of elevations, Spirit and trigonometric leveling, Relief representation,Contours,Digital elevation modeling 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.

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

### **SECTION-III - GENERAL ABILITY TEST**

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