

**BHARAT SANCHAR NIGAM LIMITED**  
( A Government of India Enterprise)  
( **BW Unit: Corporate Office**)  
10<sup>th</sup> Floor, Chandra Lok Building, Janpath, New Delhi-110001.

No. AD(BW-II)/LDCE/JTO(C)/(E)/2007

Dated : 13.08.2007.

To

1. All CGM BSNL.
2. All PCE(C)/CE(C) BSNL
3. All PCE(Elect)/CE(Elect) BSNL

Sub: Scheme and syllabus of Limited Internal Departmental Competitive Examination for appointment to the cadre of JTO(C)/(Elect) by promotion for filling up of 50 % vacancies.

Kindly find enclosed herewith the Annexure-'A' and Annexure I & IV containing the scheme and syllabus (for Civil Wing) of Departmental Examination for appointment to the cadre of JTO(C)/(Elect) working in BSNL.

As per the JTO(C)/(Elect) RRs 2001 the company's employees below 50 years of age, possessing the qualification of three year Diploma in Civil/Elect Engineering with 10 years of regular service in Group 'C' will be eligible for the Examination.

In addition to above, as per ADG(TE-II) letter No. 15-2/2005-TE-II dated 21.02.2007, all the working D/Man upto 55 years of age as on 01.07.2006 and having qualification of two year Diploma/Certificate in Civil/Electrical/Mechanical D/Manship with minimum 10 years of service in Gr'C' in the department in the corresponding stream shall also be eligible to appear in the Internal Competitive Examination as a one time relaxation. The D/Man possessing the qualification of two year Diploma/Certificate in Civil D/manship shall be eligible for the exam for JTO(Civil), whereas the D/man possessing the qualification of two year Diploma/Certificate in Electrical/Mechanical D/Manship shall be eligible for the exam of JTO(Electrical). Further to accommodate the candidates from the D/man cadre, the quota to be filled up through the Examination has also been increased from 20 % to 50 %.

Scheme/syllabus of examination may please be given wide circulation among the eligible candidates.

End.: As above.

  
(Chandra Bhushan)  
Jt.DDG(BW-I)

Copy to : 1. Jt.DDG(EW) for information please.  
2. Jt.DDG(DE) BSNL C.O. for information please.

**Subject:- Scheme of Limited Internal Departmental Competitive Examination for appointment to the cadre of Junior Telecom Officer (Civil/Elect.) by promotion for filling up 50% vacancies.**

The next Limited Internal Departmental Competitive Examination for appointment to the cadre of Junior Telecom Officer (Civil/Elect.) by promotion, in the Civil/Elect. Wing, will be held as per following details:

*2 on a one time relaxation,*  
**1.0) Eligibility:** all the company's employees below 50 years of age, possessing the qualification of three year Diploma in Civil/Electrical Engineering with 10 years of regular service in posts in Group 'C' will be eligible for the examination. In addition to above<sup>a</sup> all the working Draughtsman up to 55 years of age as on 01/07/2006 and having qualification of two year Diploma/Certificate in Civil/Electrical/Mechanical Draughtsmanship with minimum ten years service in Gr.'C' in the department in the corresponding stream shall also be eligible to appear in the internal competitive examination. The Draughtsmen possessing the qualification of two year Diploma/Certificate in Civil Draughtsmen shall be eligible for the exam of JTO(Civil), Draughtsmen possessing qualification of two year Diploma/Certificate from a recognised institution in Electrical/Mechanical Draughtsmanship shall be eligible for appearing in the internal competitive examination for JTO(Electrical).

**2.0) Syllabus & Scheme of Examination.**

**2.1) Two papers will be held for the respective cadre. The standard of examination shall generally be that of Diploma in the respective discipline. The details of papers and other requirements will be as under.**

**(A) JTO (Civil):-**

- (i) Civil Engineering Paper-I:- Multiple Choice.
- (ii) Civil Engineering Paper-II:- Subjective Type.

**(B) JTO (Elect.):-**

- (i) Electrical Engineering Paper-I:- Multiple Choice.
- (ii) Electrical Engineering Paper-II:- Subjective Type.

**2.2) Syllabus:-**

- (i) Civil Engineering Paper-I . As per annexure -I
- (ii) Civil Engineering Paper-II. As per annexure -II
- (iii) Electrical Engineering Paper-I. As per annexure -III
- (iv) Electrical Engineering paper-II. As per annexure -IV

**2.3) Other details of papers:-**

- (i) Duration of papers:- 3 Hours for each paper
- (ii) Maximum marks:- 300 Marks for each paper
- (ii) Minimum Qualifying marks:-40% in each paper

**3.0) After having qualified the Examination, the candidates shall have to undergo an in-service course with in one year to make up the shortfall in their qualification on account of the relaxation. The candidates who fail to successfully complete the in-service course shall be liable to be reverted back to their parent Draghtsman cadre.**

**ANNEXURE -1**

**SYLLABUS FOR LIMITED DEPARTMENTAL COMPETITIVE EXAMINATION  
FROM GROUP 'C' TO JTO (CIVIL)**

**CIVIL ENGINEERING PAPER- I (Multiple Choice)  
(300 Marks)**

**Time: 3 Hours.**

**I) STRUCTURAL ENGINEERING. (Basic Concepts) (50 Marks)**

Strength of materials:- Concept of stress and strain, elasticity, Hook's law, bending moment and shear force, mass moment of inertia, bending and shear stresses .

**II) SOIL MECHANICS AND FOUNDATIONS. (Basic Concepts) (50 Marks)**

Properties of soils, classification and inter-relationship, soil testing in laboratory and field identification, method of compaction and their choice, permeability, seepage, consolidation and settlement, shear strength of soil, sub-surface exploration. Types of foundations and their selection, bearing capacity, settlement, swelling and its prevention.

**III) ROADS AND DRAINAGE. (25 Marks)**

Camber, super elevations, alignments and geometric design, horizontal and vertical curves. Element of road structure, sub-base and sub-grade, surfacing and drainage. Materials and construction methods for different surfaces. (Bitumastic & Cement Concrete.)

**IV) WATER SUPPLY AND SANITARY INSTALLATIONS. (50 Marks)**

Sources of supply, yield, estimation of demand, quality standards, treatment, conveyance and distribution system of water, plumbing in buildings, tubewell.  
Sewage:- collection and disposal, sewerage systems, septic tank, soak pits.

**V) INTERIOR AND FURNISHING WORKS. (25 Marks)**

Characteristics and uses of the following interior and furnishing materials:- Plaster of paris, alluminium, particle boards, block board, plywood, laminates, gypsum board. Sound and thermal insulation materials and methods. Method of laying false floor and false ceiling and other interior refurbishing works for electronic exchanges etc.

**VI) CPWD WORKS MANUAL. ( 50 Marks)**

Stages for execution of works, preparation of bills, maintenance of registers, site order book and measurment book, quality control and technical auditing, responsibility for quality and field testing.

**VII) CPWD MENTENANCE MANUAL:- (50 Marks)**

Guidelines and related instructions & rules for maintenance of BSNL/Govt. assets and important maintenance activities to be attended to by filed officers on a daily, weekly, monthly and periodical basis, service centre, day to day repairs, special repairs, additional/alternation, preventive maintenance, encroachment, safety of buildings, monitoring of maintenance, maintenance norms, frequency of application of finishing items.

ANNEXURE -II

**SYLLABUS FOR LIMITED DEPARTMENTAL COMPETITIVE EXAMINATION  
FROM GROUP 'C' TO JTO (CIVIL)**

**CIVIL ENGINEERING PAPER- II (Subjective)  
(300 Marks)**

**Time: 3 Hours**

**I) SITE PARTICULARS AND SURVEYED SITE PLAN. (50 Marks)**

Introduction, uses, correction and adjustment of instruments like compass, staff, level, theodolite etc. compass surveying, theodolites and contour surveying, levelling, computation of areas and volume.

**II) BUILDING MATERIALS. (50 Marks)**

Characteristics, test and uses of the following building materials-

Bricks, stone, coarse and fine aggregates, cement, structural steel, steel for reinforcement, various species of timbers, various types of pipes and fittings (CI, MS, GI, PVC) glass, plywood, AC sheets, paint, varnish and distempers.

**III) REINFORCED CEMENT CONCRETE WORKS. (50 Marks)**

Basic understanding about bond length/development length, bends, loads, covers, anchorage and details of stirrups, overlap, Basic concept of design of slab, beam, column, lintel, footing and retaining wall.

**IV) PREPARATION OF N.I.T. etc. (50 Marks)**

Estimation and quantity surveying, preliminary estimate, detailed estimate, N.I.T. BSNL contract form 6 and 8 with special emphasis on clauses no. 2, 3, 6, 7, 8, 9, 10, 10A to 10E, 11, 12, 15, 16, 17 & 42, calculation of cement and steel consumptions.

**V) SURVEY REPORTS, RENT ASSESSMENT AND PLANNING etc. (25 Marks)**

Preparation of survey reports by various methods, rent assessment cases/method, preparation & interpretation of Bar Chart.

**VI) CPWD. SPECIFICATIONS. (50 Marks)**

Specifications for cement mortars for plastering and masonry, their composition, preparation, properties and tests.

Specifications for cement concrete their composition, preparation, properties and tests water cement ratio, workability, batching, mixing, placing, compaction and curing.

Specifications for earth work, anti-termite treatment, brick and stone masonry, doors & windows, cement concrete flooring, ceramic tiles flooring, mud phaska and lime terracing, sewer lines and manholes, water-supply and surface finishing works.

**VII) MAINTENANCE AND REPAIR WORKS. (25 Marks)**

Execution procedure for maintenance and repairs of buildings, water proofing of roofs and W.Cs/toilets, expansion joints.

Sources of leakages or dampness in building and their prevention. Causes, prevention and repair of cracks in buildings.

**Syllabus for Limited Departmental Competitive Examination for promotion from Group 'C' to JTO (Electrical)**

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**PAPER - I ( Multiple Choice )  
( 300 Marks - 3 Hrs. )**

**FUNDAMENTALS OF ELECTRICAL ENGINEERING AND AIR CONDITIONING**

**Electrical Engineering**

**1. General : ( 10 Marks )**

Concept of Electricity-generation, Transmission, Distribution and utilization, Electronics and communication.

**2. Principle of direct and alternating current and circuits. ( 15 Marks )**

Production of direct and alternating current, concept of frequency and wave form, instantaneous maximum and average values, form factor for sinusoidal wave. Concept of phase and phase difference. Re-presentation of alternating quantities by phasors. D.C. and A.C. circuits, concept of resistance, inductance, capacitance. Power and power factor. Alternating voltage applied to resistance and inductance in series and RLC series/ parallel circuits, practical importance of power factor. Simple problems on A.C. circuits. Concept of three phase system, star delta connection, voltage and current relationship. Simple problems.

**3. Electronics : ( 15 Marks )**

Principle of working of electronic rectifier, full wave and half wave rectifiers, coarse and fine controls, relationship between D.C. output and A.C. input voltage, ripple factor, ripple factor and ripple factor filters on the load, voltage stabilization by Zener diode.

Arrangement of cells, construction of lead acid batteries & S.M.I. batteries, Ampere hour and watt hour efficiency, simple problems. Battery charging and necessary precautions.

**5. Energy Conservation and IE Act : ( 10 Marks )**

Energy conservation Act 2001, No cost measures, Low cost and higher cost measures, Indian Electricity Act 2003, Rules as amended up to date, safety procedure & practices.

**6. Measuring instruments : ( 20 Marks )**

Electrical properties and instruments for their measurement. Working principles and construction of following measuring instruments including their errors and accuracy. Simple problems Ammeters, volt meters (moving coil and moving iron type) difference between volt meter and Ammeter. Extension of range of A.C. & D.C. instruments. Watt meters and energy Meter,

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Difference between watt meter and energy meter. Use of multi-meter, ohm meter, ger. earth tester etc. Function of the commutator for motoring and generating. Induced EMF. Characteristics of DC Generator. Principles of excitation and the relationship between terminal voltage and induced EMF.

7. **Air-conditioning** motor. Different types of excitations. Performance characteristics of different types of D.C. Motors. Starting and speed control. **A. Principle of A.C. Refrigeration** (20 Marks)

Meaning of A/C, Air conditioning methods, unit of refrigeration, A/C Carnot cycle, heat pumps, Co-efficient of performance, Rating of Refrigeration machines.

**B. Refrigerating** (20 Marks)

Important properties of a refrigerant. Property and application of commonly used refrigerants such as R11, R12, R22, NH3 and Water.

**C. Refrigeration components and controls :** (20 Marks)

Function, types, specifications, construction details of component such as compressors, condensers, throttling devices, evaporator, oil separators, spray ponds, Cooling tower, controls, solenoid valves, thermostat, LP/HP cut out, oil safety switch.

**D. Psychrometry** (30 Marks)

Concept of dry and wet temperature, dew points, relative humidity, absolute humidity, humidity ratio, Enthalpy. Psychrometry of moist air, Psychrometric chart and its uses.

**E. Heat Loads** (20 Marks)

Description of various types of heat load, Sensible and latent heat load, sensible heat factor, by pass factor. Apparatus dew point.

**F. A.C. System** (20 Marks)

Description of split system, window package air conditioner, unitary system, etc. Description of filter, dampers, fans blowers, air ducts, grills and diffusers, etc. s. chillers etc.

**G. Measuring Instruments** (20 Marks)

Measuring instruments such as pressure gauge, sling psychrometer, flow meter, Tachometer, anemometer etc. with their working principles and constructional details.

8. **ELECTRICAL MACHINES**

A. Basic principle of electrical machines, torque due to alignment of fields and the concept of torque angle, electromagnetic force. Elementary concept of an electrical machines. (10 Marks)

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**.C. Machine**

Main constructional features. Function of the commutator for motoring and generating action. Factors determining induced EMF. Characteristic of DC Generator. Principles of generating and motoring action and relationship between terminal voltage and induced emf. Factors determining the speed of the motor. Different types of excitations. Performance and characteristic of different types of D.C. Motors. Starting and speed control. Cause of sparking and necessity of inter poles. Losses and efficiency. Application. ( 10 Marks )

**C. Induction Machine**

Principle of operation. Locking of rotor and stator fields Rotor current, rotor torque, relationship between the rotor I<sup>2</sup>R loss and the rotor slip. Factor determining the torque. Effect of rotor resistance upon the torque-slip relationship, cage rotor Motor. Speed control of cage rotor motors, causes of low powers factor of induction motors. Testing of three phase induction motor. Installation and maintenance of induction motors. ( 10 Marks )

**D. Synchronous Machines**

Main constructional features, generation of EMF. Generations of three phase emf. three phase windings. Production on rotating magnetic field in a three phase winding. Operation of a single synchronous machine when independently supplying a load, operation of synchronous machine when connected to in-finite bus-bars. Parallel operation of two alternators. Synchronizing of alternators. Starting and application of synchronous motors. Heating and Cooling of synchronous machine. ( 10 Marks )

**E. Fractional Horse Power Motors**

Single phase induction motors, nature of field produced in single phase induction motor. Capacitor start and running motor. Shaded pole motor. A.C. series motors. Reluctance motors ( 10 Marks )

**F. Single and Three Phase Transformers**

Definition and principle. Approximate EMF equations, phasor diagram for transformer. Regulation and no-load current. Mutual and leakage fluxes. Leakage reactance. Equivalent circuit. Load regulation, open circuit test, losses. Efficiency (Commercial and all day efficiency) and condition for maximum efficiency. Auto transformer. Instrument Transformers such as C.T. and P.T. power Transformers. Cooling of transformers. ( 10 Marks )

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3. **Basic principles of transmission and distribution of Electrical Energy.**

Switch gear, power cables and protective devices. **( 10 Marks )**

4. **Pumps**

Type of pumps, Centrifugal, reciprocation and deep wall pumps and their uses, types of impellers. Work done, efficiency. Performance curves of centrifugal pumps. **( 10 Marks )**

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**Syllabus for Limited Departmental Competitive Examination for promotion from  
Group 'C' to JTO (Electrical)**

**Paper - II**

**( 300 Marks - 3 Hrs. )**

**Design and Estimation of Simple Electrical Installation**

**Electrical Installation and Wiring**

1. Types of Wiring, General CPWD specifications, earthing testing, fault finding in electrical wiring and electrical equipment like fans, light fittings etc. including their principle of operation, Lightning conductors, compound lighting, IEE rules. ( 50 Marks )
2. Designing and Estimation of Internal Electrical Installation and Fans including Main boards, Sub distribution and Earthings. ( 50 Marks )
3. Designing and Estimation of compound and street lighting schemes. ( 50 Marks )
4. Designing and estimation of Sub Station installation. ( 50 Marks )
5. C.P.W.D. specification for internal / external installation. ( 50 Marks )
6. Designing & Estimation of fire detection & fire fighting system in Telephone Exchange Premises. ( 50 Marks )

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