

Govt. of India
No.16/3/2007-Exam
O/o Additional Director General(Trg.)
Central Public Works Department
Training Institute
E-Wing:Nirman Bhawan:New Delhi

NOTICE

LIMITED DEPARTMENTAL COMPETITIVE EXAM - 2007 **FOR THE POST OF** **JUNIOR ENGINEER (CIVIL & ELECTRICAL)**

Dt. 25.09.2007

A Limited Departmental Competitive Examination for the post of Junior Engineer (Civil & Electrical) in the scale of Rs.5000-150-8000 in the Central Public Works Department will be held by the CPWD Training Institute, E-Wing, Nirman Bhawan, New Delhi-110 011 on **30.12.2007** at **Delhi, Mumbai, Kolkata, Chennai** in accordance with the Recruitment Rules published in the gazette of India dt.20.03.1993.

1. THE CENTRES AND THE DATE OF HOLDING THE EXAMINATION AS MENTIONED ABOVE ARE LIABLE TO BE CHANGED AT THE DISCRETION OF THE ADDITIONAL DIRECTOR GENERAL (TRAINING). WHILE EVERY EFFORT WILL BE MADE TO ALLOT THE CANDIDATES TO THE CENTRE OF THEIR CHOICE FOR EXAMINATION, THE A.D.G.(TRAINING) MAY, AT HIS DISCRETION, ALLOT A DIFFERENT CENTRE TO A CANDIDATE WHEN CIRCUMSTANCES SO WARRANT. CANDIDATES ADMITTED TO THE EXAMINATION WILL BE INFORMED OF THE TIME TABLE AND PLACE OR PLACES OF EXAMINATION. (See Annexure-A Instructions to candidates under para-5).

2. The number of vacancies for the year 2005-06 to be filled up on One-Time Basis by the LDCE are as follows :

Disciplines No. of Vacancies

J. E.(Civil) 140 (OC-72, SC-21, ST-10, OBC-37)

J.E.(Elect.) 50 (OC-26, SC-07, ST-04, OBC-13)

3. The Examination will be open to the employees (work charge/regular) working in CPWD and possessing diploma or any higher qualification in Civil/Electrical/Mechanical Engineering from an Institute recognized by the Central Government or equivalent qualification and who have joined on or before 01.01.2000 in the Department and have a minimum of five years qualifying service as on 01.01.2005 shall be eligible to appear in the examination. However, after the examination, merit list based on aggregate marks finally awarded to each candidate will be prepared separately in the respective discipline (i.e. Civil/Electrical).

Cut-off date in respect of date of joining for the eligibility of a candidate for becoming due for consideration for the vacancies of the particular year will be 1st January of the year, five years preceding to the year of consideration, for example :

“for filling up of vacancies for the year 2005-2006 the cut-off date is 1st January, 2000. It means those candidates who would have joined the department on or before 1st January, 2000 would be eligible for the vacancies for the year 2005-2006”.

N.B. : Candidates should indicate clearly in their application the Grade i.e. Junior Engineer(Civil) or Junior Engineer(Electrical) for which they wish to compete.

4. A candidate seeking admission in the Examination must apply to the **Section Officer(Exam Cell), Room No.329, A-Wing, Nirman Bhawan, New Delhi – 110108** on the prescribed form of application. Prescribed form of application is enclosed which may be photocopied or on the Internet at the side www.cpwd.nic.in which can be downloaded by the candidates.

5. **Closing Date** : The completed application form **Through Proper Channel** must reach the **Section Officer, Examination Cell under Superintending Engineer (Training)-I, CPWD, Room No.329 `A' Wing, Nirman Bhawan, New Delhi-110108 by Friday, 26th October, 2007.**

Application received after due date (i.e. **Friday, 26th October, 2007**) will not be considered.

6. A candidate is advised to specify clearly in the application form the order of preference, the region where he wants his postings to be made in case he is selected for appointment on the basis of examination. The details of regions are given below :

- i) **Region ‘A’ comprising of** : 1.Delhi 2.Jammu & Kashmir 3.Punjab 4.Himachal Pradesh 5.Haryana 6.Uttar Pradesh 7.Uttaranchal 8.Chandigarh 9.Rajasthan.
- ii) **Region ‘B1’ comprising of** : 1.West Bengal 2.Bihar 3.Orissa 4.Sikkim 5. Jharkhand 6. Chattisgarh
- iii) **Regional ‘B2’ comprising of** : 1. Assam 2.Meghalaya 3.Manipur 4.Tripura 5.Nagaland 6.Arunachal Pradesh 7. Mizoram
- iv) **Region ‘C’ comprising of** : 1.Maharashtra 2.Madhya Pradesh 3.Gujrat 4.L.M.Islands 5. Daman & Due 6. Goa
- v) **Region ‘D’ comprising of** : 1.Tamilnadu 2.Kerala 3.Karnataka 4.Andhra Pradesh 5.Andaman Nicobar Islands 6.Pondicherry

Efforts would be made to post him in the areas of his preference depending upon vacancies in the prescribed region. In case this is not possible, he will be required to serve anywhere in India. The candidates who will not fill all the preferences for the region will be considered for any region depending upon his merit.

7. The rules for the Examination shall be as given in the Annexure-B.

8. The ADGs/CEs/SEs/EEs in the CPWD are requested to give this notice wide publicity and forward the application of the eligible candidates to the Section Officer(Exam Cell), Room No.329, A-Wing, CPWD, Nirman Bhawan, New Delhi-110108.

APPLICATION NOT COMPLYING WITH THE ABOVE REQUIREMENTS WILL BE SUMMARILY REJECTED.

-Sd/-
(Jai Prakash)
Superintending Engineer(Trg.)-I

To

1. All Additional Director Generals/Chief Engineers/Superintending Engineers/ Executive Engineers in Central P.W.D./P.W.D. They are requested to give this notice wide publicity and forward the application of the eligible candidate to the Section Officer (Examination Cell) under Superintending Engineer(Trg)-I who function as the Controller of Examination. (They are requested to keep CR Dossiers of all candidates ready in their offices, which could be forwarded immediately as and when dossiers are called for).
2. The President, CPWD Mazdoor Union, E-26, Raja Bazar, Old Quarter, Baba Kharag Singh Marg, New Delhi.
3. The President, CPWD Workers Union, CPWD Stores Building, Jorbagh Lane, Aliganj, New Delhi.
4. The President, All India CPWD Employees Union, Lodhi Colony Enquiry Office, New Delhi.
5. The All India Engineering Drawing Staff Association, CPWD.
6. The J.Es Association, CPWD.

Instruction to Candidates

1. *Before filling in the application form, the candidates should consult the Notice and the Rules carefully to see if they are eligible. The conditions prescribed cannot be relaxed.*

BEFORE SUBMITTING THE APPLICATION THE CANDIDATE MUST SELECT FINALLY FROM CENTRES GIVEN IN PARAGRAPH- 1 OF THE NOTICE THE PLACE AT WHICH HE WISHES TO APPEAR FOR THE EXAMINATION.

Candidate should note that no request for change of centre would normally be granted. When a candidate, however, desires a change in centre, from the one he had indicated in his application form for the Examination, he must send a letter addressed to the Additional Director General(Training) giving full justification as to why he desires a change in centre. Such requests will be considered on merits but requests received after 02.11.2007 will not be entertained under any circumstances.

2. The application form must be completed in the candidate's own handwriting in ink or with ballpoint pen. An application, which is incomplete or is wrongly filled in, will be rejected.

Candidates should note that only International form of Indian numerals are to be used while filling up the application form. Even if the date of birth in the SSLC or its equivalent certificate has been recorded in Hindi numerals, the candidate should ensure that while entering it in the Application Form he uses International form of Indian numerals only. They should take special care that the entries made in the application form should be clear and legible. In case there are any illegible or misleading entries, the candidates will be responsible for the confusion and the ambiguity caused in interpreting such entries.

Candidates should further note that no correspondence would be entertained by the Additional Director General (Training) or from them to change any of the entries made in the application form. They should, therefore, take special care to fill up the application form correctly.

A candidate must submit his application Through Proper Channel of his Office concerned, who will complete the endorsement at the end of the application form and forward it to O/o ADG(Trg.) at the address given below:

Shri S.N.Chauhan
Section Officer (Exam. Cell),
O/o Additional Director General (Trg.)
CPWD, Room No.329, "A" Wing,
Nirman Bhawan, New Delhi - 110108.

3. A candidate must send the following documents with his application :-
- i) Attested copy of Diploma Certificate (Civil/Electrical/Mechanical)
 - ii) Two identical copies of recent passport size (5 cm. x 7 cm. approx.) photographs of the candidate. – A candidate must submit two identical copies of his recent passport size (5 cm. x 7 cm. approx.) photograph, one of which should be pasted on the first page of the application form and the other copy on the Attendance sheet in the space provided therein. **Each copy of the photograph should be signed in ink on the front by the candidate.**
 - iii) Attendance Sheet (attached with the Application form) duly filled in.
 - iv) Two self-addressed unstamped good quality envelopes of 11.5 cm. x 27.5 cm. Candidate should write neatly his complete postal address i.e. his Name, House No., Ward No., Mohalla etc. on the envelopes. In cases where House No. is not there, the candidate should write his own full name, followed by his father's name with postal address.
 - v) One self addressed post card.
 - vi) Attested copy of Caste Certificate whether SC/ST/OBC should be attached with application form.

NB – Candidates are warned that if an application is not accompanied with the documents mentioned under paragraph 3 above, it will be rejected and no appeal against its rejection will be entertained.

4. Candidates are warned that they should not furnish any particulars that are false or suppress any material information in filling in the application form.

Candidates are also warned that they should in no case correct or alter or otherwise tamper with any entry in a document or its copy submitted by them nor should they submit a tampered/fabricated document.

5. Admission Cards will be issued for this Examination, if a candidate does not receive admit card from Exam Cell under ADG(Trg), CPWD by 07.12.2007, he should at once contact the Section Officer, Examination Cell at the address given at para 2 above. Failure to comply with this provision will deprive the candidate of any claim to consideration.

6. Communications regarding Applications - ALL COMMUNICATIONS IN RESPECT OF AN APPLICATION SHOULD BE ADDRESSED TO THE ADG (TRG.) AND SHOULD INVARIABLY CONTAIN THE FOLLOWING PARTICULARS.

- (1) NAME OF EXAMINATION
- (2) MONTH AND YEAR OF EXAMINATION
- (3) CENTRE OF EXAMINATION OR THE DATE OF BIRTH OF CANDIDATE IF ROLL NUMBER HAS NOT BEEN COMMUNICATED.
- (4) NAME OF CANDIDATE (IN FULL AND IN BLOCK CAPITALS)
- (5) POSTAL ADDRESS AS GIVEN IN 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 THE EXAMINATION HAS BEEN HELD AND IT DOES NOT GIVE HIS FULL NAME AND ROLL NUMBER IT WILL BE IGNORED AND NO ACTION WILL BE TAKEN THEREON.

7. CHANGE IN ADDRESS : A CANDIDATE MUST SEE THAT COMMUNICATIONS SENT TO HIM AT THE ADDRESS STATED IN HIS APPLICATION ARE RE-DIRECTED, IF NECESSARY. CHANGE IN ADDRESS, IF ANY, SHOULD BE COMMUNICATED TO THE ADG (TRG.) AT THE ADDRESS GIVEN IN PARA 2 ABOVE, AT THE EARLIEST OPPORTUNITY GIVING THE PARTICULARS MENTIONED IN PARAGRAPH 6 ABOVE. ALTHOUGH THE OFFICE OF THE ADG (TRG.) WOULD MAKE EVERY EFFORT TO TAKE ACCOUNT OF SUCH CHANGES, IT CANNOT ACCEPT ANY RESPONSIBILITY IN THE MATTER.

RULES

The rules for the Limited Departmental Competitive Examination for the post of JEs(Civil/Elect.) in Central Public Works Department are as follows :

- 1.1 The Examination will be open to the employee (Work-charged/regular) working in Central Public Works Department and possessing diploma in Civil/Electrical/Mechanical Engineering or any higher qualification from an Institute recognized by Central Government or equivalent thereto with 5 years continuous service in the Central Public Works Department and who have joined on or before 1.1.2000 shall be eligible to apply. **There is no age limit.**

Cut-off date in respect of date of joining for the eligibility of a candidate for becoming due for consideration for the vacancies of the particular year will be 1st January of the year, five years preceding to the year of consideration. For example :

“for filling up of vacancies for the year 2005-2006, cut-off date is 1st January, 2000. It means those candidates who would have joined the department on or before 1st January, 2000, would be eligible for the vacancies for the year 2005-2006”.

- 1.2 The decision of the Additional Director General(Trg), CPWD as to the eligibility or otherwise of the candidate for admission to the Examination shall be final.
- 1.3 No candidate shall be admitted to the Examination unless he holds a certificate of admission from the Controller of Examination.
- 1.4 The candidate who is or has been declared by the Controller of Examination guilty of impersonation or submitting incorrect statement or attempting to use unfair means in the examination hall or misbehaviors in the examination hall, may
- a) be debarred permanently for a specified period
 - i) by the Supervisor of the Examination concerned for admission to the remaining papers of the Examination.
 - ii) By the Central Government from employment under them.
 - b) be liable to disciplinary action as per rules.
- 1.5 After the examination the candidate will be arranged by the Controller of Examination in the order of Merit, as per the marks finally awarded to each candidate and in that order of merit so many candidates as have been found by the Controller of Examination to be qualified in the exam shall be recommended for promotion upto the required number. Candidates should clearly understand that this is a competitive and not a qualifying examination. The number of persons to be promoted on the results of the examination is entirely within the competence of

Government to decide. No candidate will therefore have any claim for appointment on the basis of his performance in this examination, as a matter of right.

- 1.6 Success in the examination would confer no right on the candidate for appointment to the post of Junior Engineer.
- 1.7 Candidates are allowed the option to answer the paper in English or Hindi.
- 1.8 No request for revaluation of papers will be entertained. However, request for re-counting may be entertained within one month of the declaration of the result for which candidates has to pay Rs.500/- per paper.
- 1.9 **Scheme of Examination** : The Examination shall consist of objective type test. The details are as under :

Subject for JE(Civil)	Maximum Marks	Time Allowed
1. General Engineering	100	3 Hours
2. Structural Engineering	100	3 Hours
3. Assessment of Confidential Reports	50	

Subject for JE(Elect.)	Maximum Marks	Time Allowed
1. General Engineering (Electrical)	100	3 Hours
2. Mechanical Engineering	100	3 Hours
3. Assessment of Confidential Reports	50	

- 1.10 **Syllabus** : As per Annexure-C.

Roll No.

For Official use only

ADDITIONAL DIRECTOR GENERAL(TRG.), CPWD
Limited Departmental Competitive Examination – 2007
For the Post of Junior Engineer(Civil & Elect.) in
CPWD

APPLICATION FORM (PART – I)

PHOTO
(5 cms. x 7 cms.)
with signatures

1. Posts for which you want to compete : _____
Write Civil or Electrical
2. Name in Block Letters as per service : _____
record
3. Postal Address in Block letters : _____

Day		Month		Year			

4. Date of Birth as per service record : _____
5. Community, whether SC/ST/OBC/Others: _____
6. Centre of Examination : _____
(Delhi/Mumbai/Kolkata/Chennai)
7. Medium of Examination : _____
Write Hindi or English

8. Date of Joining from which you : _____
are regularly appointed in CPWD

Day		Month		Year			

9. Whether you are holding an Ex-cadre : _____
post and have a lien

10. Indicate the choice of Region in order of : _____
Preference (see para 6 of the notice)

1	2	3	4	5

11. List of Documents attached with application: _____
(As per para 3 of Annexure 'A')

DECLARATION TO BE SIGNED BY THE CANDIDATE

I hereby declare that all statements made in this application are true, complete and correct to the best of my knowledge and belief. In event of any information being found false or incorrect or ineligibility being detected before or after the examination, the Department under Rule 1.4 of the Rules of the Examination can take action against me.

I have read rules in the Rules and Notice of the departmental examination carefully and I hereby undertake to abide by them.

Signature of Candidate

Date :

Place :

Application not signed by candidate will be rejected.

**PART – II : To be filled in by the Head of the Department or
Office in which the candidate is serving**

Certified that the entries made by Sh./Smt. _____ in all columns have been verified with reference to his/her record and are correct and is eligible to appear to this examination as he/she has put in minimum five years qualifying service as on 01.01.2003. It is also certified that he/she has submitted the application form to this office on _____ for onward transmission to the ADG(Trg.).

Signature :

**Designation :
with office Stamp**

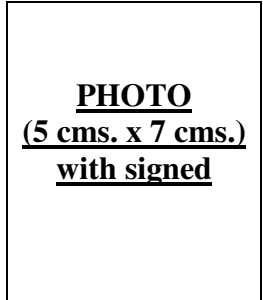
Date :

Roll No.

For Official use only

ADDITIONAL DIRECTOR GENERAL(TRG.), CPWD
Limited Departmental Competitive Examination – 2007
For the post of Junior Engineer(Civil & Elect.) in CPWD

CANDIDATES ATTENDANCE SHEET



1. Name of Candidate : _____
2. Community, whether SC/ST/
OBC/Others : _____
3. Posts for which you want to compete : _____
Write Civil or Electrical
4. Schedule of Examination (To be filled in by the candidate in
Examination Hall) :

Sl.No.	Date	Subject and Paper	Candidate's Signature
1.			
2.			

Signature of Invigilator

SYLLABUS FOR JUNIOR ENGINEERS (CIVIL)
DEPARTMENTAL CANDIDATES

PART – I

GENERAL ENGINEERING (CIVIL)

SURVEYING

Chain Survey : Ranging and chaining, Linear measurements, limit of errors Reconnaissance, fixing station, use of cross-staff and optical square and sketching. Field book and entry, plotting. Calculations of area; Planimeter. Reducing and enlarging maps and instruments used.

Compass survey magnetic and true north. Bearing, Surveying and prismatic compasses. Traversing, Testing and adjustment of a compass. Methods of reckoning bearing, whole circle and quadrantal. Application of compass surveying. Field book. Local attraction and its elimination, plotting, closing error and its adjustment.

Plane Table Survey : Instruments and their use. Methods of plane table surveying. Fixing of position and orientation. Resection, two and three point problems. Advantage and accuracy of plane table surveying. Plane table surveying in combination with other methods.

Levelling : Principles of the telescope. Theory of levelling. Datum Benchmark. Reduced level. Level surface and horizontal plane. Types of levels. Dumpy level and its adjustments. Levelling staff. Effects of curvature and refraction, Precautions to ensure accuracy. Permissible error. Fly levels. Methods of levelling: longitudinal, cross-section and reciprocal levelling. Field Book. Entry and plotting. Contouring on land and water. Hand levels, spirit level, clinometer, Abney's level and gnat tracer.

Theodolite Survey : Types of theodolite. Uses method of Plotting. Checks, adjustment of errors, open and closed traverse and their application to engineering problems, Calculation of areas from traverses. Determination of heights.

Tachometric Survey : General Principles of Stadia method Constants of the tachometer. Theory of the anallatic lens. Sloping ground, reduction of readings, and direct reading instruments. Movable hairs, testing instruments, fieldwork degree of accuracy, tachometer for levelling and theodolite survey.

Curves : Simple, compound, reverse and transition curves. Vertical curves for roads and railways. Curve ranging.

Earthwork : Determination of classified quantities in excavations. Prismatic and curvature corrections. Volumes by spot level and contours. Mass diagrams. Calculations of haul and overhaul Sections and volumes. Lift and load.

MATERIALS

Stones : Varieties of Indian Stone. Quarring and blasting with explosives. Dressing of stone and implements used. Characteristic of Stones. Artificial stones.

Bricks and Refractories : Brick earth, tempering, hand ground, pallet, table and machines moulding, Burning of bricks, clamps and Kilns. Coloured bricks, Tiles, Roofing, flooring and drains. Manufacture of tiles. Characteristics and tests of good bricks and tiles. Special types of bricks and tiles. Refractories of different types, their properties and uses.

Limes and cements : Limes : Sources, varieties, properties and burning. Types of Kilns. Slaking of lime, Mixing of mortar. Uses, Concrete, ingredients. Sources, varieties, properties and methods of manufacture. Hydraul co mortar, sand surki and concrete. Hollow cement blocks. Tests for lime and cement. Plaster and plastering : plain cement, rough cast, stucco, fibrous. Colour crate, lathwork, water proofing, guniting. Gypsum and plaster of Paris, Properties and uses. Glazing and papering.

Timber : Growth of trees. Felling, Varieties of Indian timber. Characteristic and suitability for different purposes. Seasoning, Defects and decay. Preservation. Fireproofing Tests for good timber. Manufacture and users of Plywood and pressed wood. Proprietary timber products and used for sound and thermal insulation.

Metals, Pig iron, cast iron, malleable iron, steel. Manufacturing processes, castings, characteristics, forms and uses of cast iron, wrought iron and steel. Galvanising oxidation and plating of metallic products. Corrosion of iron and steel and their prevention. Non-ferrous metals, copper, zinc, lead, tin and aluminium. Their properties and uses. Composition, properties and uses of important alloys like brass, bronze, invar white metal antifricition bearing metals, duralumin etc.

Paints and Varnishes : Ingredients of paints, Turpentine, linseed oil. Paining of old land raw wood and iron work. Painting of walls. Wood oil, Coal tar. Distemper. Varnish. Glue size, Patty glazing.

Miscellaneous materials : Asphalt bitumen, asbestos, rubber leather, glass felt, coir, ceramics and plastics. Products from these, their properties and engineering uses.

Water Supply and Sanitary Engineering

General : Elementary bacteriology and chemistry of water and sewage. History and development of water works. Necessity and importance of water works. Essentials of water supply schemes. Estimation of quantity of water for various purposes. Allowance for prospective population, variation in demand. Quality of water, requisites of wholesome water Sources, rivers, ground water, springs, wells. Selection of source, quantity available. Reservoirs intake works, tunnels infiltration galleries, Protection from pollution. Impurities. Water analysis, standards tests.

Water Supply Schemes : Gravitational pumping, oil steam and electric power for pumping. Different types of pumps, Booster pumps. Pumping power in relation to demand and storage. Purification works, epidemics and their relation to polluted water. Influence of PH purification methods. Water softening. Removal of iron tastes and odours. Conveyance and distribution of water. Different and special types of pipe, design and protection of pipes. Joints, expansion joints. Testing of joints, arms and systems of distribution, fire and service hydrants, leakage testing, water meters, laying and jointing mains. Project estimate, cost of water rate per house connection, and rate for metered water. Maintenance of record of different water works for comparison purpose.

Sanitary Engineering : Sanitation, Dry method of disposal of waste matter refuse, destruction, surface drainage.

Sewerage : Separate and combined system. Rate of flow of sewerage. Variation capacity, allowance per head for design of sewers. Storms sewerage Design of sewers : gradient, size and shape. Materials for sewers : Stoneware, iron, precast and insitu concretes, masonry, sewer, accessories. Manholes, house connections, storm water overflow inverted siphons, flushing and ventilation. Testing of sewer. Sanitary plumbing. Disposal works history. Oxidation method. Land treatment. Land irrigation, contact beds, percolation filters. Activated sludge process and other biogenation methods.

Sludge : Final disposal of sludge. Drying lagoons, burial and incineration. Sludge gas.

PAPER – II

STRUCTURAL ENGINEERING

Stress and strain, Simple stresses and strains. Hooke's Law Behaviour of materials subject to stress. Stress strain diagram. Elastic limit, yield point ultimate strength, working stress factor of safety. Elastic constants and the relationship between them. Simple testing, machines of their working, Standard test pieces Shearing and Bending. Shearing forces and bending moments in simply supported beams and cantilevers under different condition of static loading. Theory of simple bending. Stresses due to pure bending. Moment of resistance of section. Beams of uniform strength. Distribution of shear stress.

Stress determination in roof trusses, and girders and Riveted joints, Resistance of a rivet in single or double shear and bearing. Working strength. Strength of lap and butt joints. Efficiency of a joint.

STRUCTURAL STEEL AND WOOD

Beams and Girders : Properties of Indian Standard sections. Detailed design of beams, compound girders and built up web plate girders in steel and timber, limiting span and economical depth. Design of flanges and web. Curtailment of flange plates. Determination of size, pitch and arrangement of rivets in flanges and web. Types of stiffeners, their spacing and empirical rules thereof. Design of joints and connections. Design of splices for plates, angles and joints. Design and web splice for plate girders.

REINFORCED CONCRETE

General Principles : Permissible stress as per ISI standards Beams slabs and columns : Theory and design of one way and two way reinforced slab, rectangular and T-beams freely supported and continuous. Ordinarily and Helical reinforced short and long columns with axial and eccentric loading. Design of shear reinforcement for beams and columns.

Retaining Walls : Detailed Design of cantilever and counterfort type. Methods and details of construction. Methods of relieving earth pressure behind retaining walls.

SYLLABUS FOR JUNIOR ENGINEER (ELECT.)
DEPARTMENTAL CANDIDATES

1. ELECTRICAL ENGINEERING

General : Electromotive force, potential difference, electric current and resistance. Ohm's law, resistivity and calculation of resistance. Temperature co-efficient of resistance. Heating effect of current. Energy and power and their units in electrical thermal and mechanical systems. Kischof's law, wheel-stone bridge. Simple potentiometers. Insulation and insulation resistance. Lead-acid and nickel iron cells. Charging and discharging of cells.

Electric magnetism : Magnetic field due to current in conductors. Coil and solenoids. Magneto-motive force and magnetic reluctance. Calculation of amperes turns. Residual magnetism. Pystorosis and eddy current. Self and mutual inductance.

Alternating current : Production of alternating current. Instantaneous voltage average and R.M.S. values of alternating current and voltage. Vector representations. Power and power factor. Star-Delta connections. Power measurements by different methods in polyphase circuit. Use of capacitors for power factor improvements.

Electrical Machines : Characteristics of D.C., shunt series and compound generators and motors, Starter control gear. Speed control of D.C.Machnines.

b) L/C Machines : Alternators; constructional features, armature reaction, synohronuous competence. Voltage regulation of alternators, synchronosing and load sharing of A/C generators Schronous motors, Induction motors-constructional features Torque slip Characteristics starting methods, speed control, Double gauge motors, Slopping motors, type test on induction motors, Indian Standard specifications.

Transformers : Constructional features, method of cooling. Transformers connections and vector groups, off load and on load tap changers, grounding of transformer neutral Parallel operation. Type tests, Indian Standards.

Electric Power : Sources of power generations and their relative importance. Simple layouts of Hydro, steam and diesel generating stations, essential item of equipment in these power stations. Load estimates. Demand-factor, load factor, diversity factor, typical load curves. Principles of Selection for size of unit and general considerations for stand by units.

Over head lines : Determination of size and conductors. Arrangement of conductors, various type of insulators. Feeders, distributors and service mains, design considerations – Kalvin's Law, voltage regulation in distributors.

Cables : Different types of underground cables. Their electrical characteristicfs and broad constructional features, grading of cables. Methods of laying cable, various types of cable joints, fault location on cables.

Switch Gear : Different types of medium voltage and U.T. Switch gear and their application. HRC fuses, sub stations typical layouts. Short circuit calculation prospective relays, constructional features, principle of operation for over-current earth fault and differential relays. Directional relays.

Illumination : Law of illumination, lighting calculations, depreciation factor, utilisation factor, design standards for illumination, different types of lamps and their working.

2. MECHANICAL ENGINEERING

Materials sciences and processes : Mechanical properties, Tensile strength, yield strength, creep, impact strength, interpretation of various test results, Atmospheric exposure and effect of low temperature on properties of metals.

Heat Treatment : Annealing, normalising, case hardening various types of carbon steels, their properties and uses. Effect of alloy additions and characteristics of alloying elements.

CORROSION : Various types and their prevention.

Fundamental analysis of metal processing i.e. machining, rolling, forging, extrusion, welding and related techniques, metallurgical and properties stand point.

Boilers : Various types of smoke type and water tube boilers. General description with sketches of principles types. Super heaters economisers, feed pumps, induced draft, forced draft fans. Boiler mountings, treatment of water.

Internal combustion Engines : General study of internal combustion cycles, various thermo dynamic process involved in Carnot cycle. Rankin cycle and Diesel cycle. Constructional details of internal combustion engines Criteria for performance. Indicator diagram. Performance tests of diesel/petrol engines. Oil care and maintenance, ignition system cooling system, lubricating system of petrol and diesel engines. Crank shaft deflection and alignment.

Refrigeration and A/C : Refrigeration theory, thermodynamics of vapour compression systems. Constructional details of refrigeration equipment, compressors, condensers, evaporators coils, fans, expansion valves. Air conditioning plant lay-outs.

Centrifugal Pumps : Classification of different types and their characteristics. Multi-stage pumps variable pumps, submersible pumps, selection principles, testing of pumps.