

Dated:- 21.08.2019

No:- ECR/HRD/GAZ/254/AEE (Gr.'B)/30%/2019
Secy. to GM/ECR: For kind information of GM
PS-I to AGM: For kind information of AGM
SDGM/ECR/HJP
General Manager (P)/CORE/Allahabad
General Manager/RITES/NDLS
PCEE/ECR/HJP
CAO(Con)/MHX/ECR/PNBE, CAO/WP/PNBE
CAO (GELF)/ECR/DMH
CPD/RE/DNR
Chairman/RRB/Patna & MFP
DRM/ECR/DNR, MGS, DHN, SEE & SPJ
CWM/PD/ECR/MGS, WS/SPJ & CRW/HRT
Sr.DPO/ECR/DNR, MGS, DHN, SEE & SPJ
Sr. DEEs/DEEs/ECR/DNR, MGS, DHN, SEE & SPJ
Dy.CPO/HRD/ECR/HJP
Principal/ZRTI/E.C.Rly/Bhuli & MFP
SPO/MPP/ECR/HJP : for uploading on website.
SPO/Rectt/ECR/HJP
All Extra Divisional Units

Sub:- Limited Departmental Competitive Examination (LDCE) for the post of AEE (Gr. 'B') in pay band ₹ 9300-34800 (Level-8) Grade pay ₹ 4800 against 30% quota.

It has been decided with the approval of the Competent Authority to hold a LDCE for forming a panel against 04 vacancies (UR-04, SC-Nil, ST- Nil) of AEE (Gr. -'B') against 30% quota on E.C. Railway.

The details are given below:-

(1) TENTATIVE PROGRAMME OF PRE-QUALIFYING, MAIN EXAMINATION & VIVA-VOCE

- | | |
|---|------------------------------------|
| (A) Date of <u>Pre-qualifying examination</u> (100 Marks/Objective type MCQ) :- | } Will be intimated in due course. |
| (B) Date of <u>Main examination</u> (100 Marks/Descriptive type) :- | |
| (C) Venue :- | |
| (D) Duration :- | |
| (E) Viva-voce :- | |

(2) Eligibility:- (As on 13.04.2019)

- a) All permanent Group 'C' technical staff & running staff of Electrical Department working/holding lien in Electrical Department of East Central Railway in Pay Band Rs.9300-34800 (PB-2) with Grade Pay Rs.4200/- (Level- 6 in 7th CPC) and above including Shunter-II of Electrical Department/E.C. Railway working in Pay Band Rs 5200-20200/- (PB-1) Grade Pay Rs.2400/- (equivalent to the stationary post in Pay Band Rs.9300-34800/- (PB-2) Grade Pay Rs.4200/- & above as per RBE No. 92/2015) including those who are working in other Railways/units on deputation having lien and seniority over East Central Railway and completed minimum 5 years of non-fortuitous regular service in the grade(s) as on 13.04.2019 are eligible to volunteer for the LDCE.

NB.However, those Gr.'C' employees who have been provided Grade Pay 4200/- or above in PB-2 (9300-34800) under ACP /MACP are not eligible to volunteer for the above written examination.

The cut-off date of eligibility for selection against 30% quota (LDCE) is 13.04.2019 which is same as in selection against AEE/Gr. 'B' (70%).


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- b) As per Railway Board's letter No. E(GP)2005/2/74 dt 13.03.08 (RBE 40/08), in case of persons transferred at own request to this Railway in the same category of posts, and assigned bottom seniority therein, the service rendered by them in the previous unit may be reckoned for determining their eligibility wherever a minimum length of service is prescribed as a condition for promotion in the new unit, subject to the condition that the length of service which is so allowed to be counted does not exceed the length of service of their immediate senior in the new unit.
- c) Those Railway employees who have come on own request transfer/mutual transfer and joined E.C. Railway after the cut off date i.e. 13.04.2019 will not eligible to appear in this selection.
- (3) Eligible staff who desire to volunteer for the above LDCE may submit their application through proper channel to their respective Personnel Branch where they hold lien & seniority.
- (4) Eligible staff working in the Construction/Project Organization on deputation or in training or in any ex-cadre post, who desire to volunteer for the above LDCE may also submit their application through their respective Personnel Branch where they hold lien & seniority. The Personnel/Controlling Officers of the concerned Divisions/Units are advise to transmit the notification to the staff, who are on deputation through their Divisions/Units.
- (5) When an employee is holding an ex-cadre post, details of his/her post in regular cadre with the grade and date of entry as a regular measure should be furnished. This may also be brought to the notice of all concerned. It may be ensured that wide publicity is given to this notification amongst all the eligible staff. It is the personal responsibility of the Personnel Officers/Controlling Officers of the Units to ensure that the notification reaches to all the eligible employees well in time.
- (6) All the volunteers who fulfill the above mentioned conditions of eligibility will get the chance to compete in the said LDCE, without any restrictions to the number of candidates to be allowed for appearing in the examination.
- (7) The above LDCE will be based on the candidate's performance in Written Examination, viva-voce & record of service. Only the candidates, who qualify in the Written Examination, and found medically fit for Safety category post of AEE(Gr.B) as prescribed in Indian Railway Medical Manual will be called for Viva-voce test. The placement of the candidates in the panel will be based on their performance in Written Examination, Viva-voce test and Record of Service as per extant instructions of Railway Board and will be strictly as per merit.
- (8) In terms of RBE No. 53/2019, dt. 19.03.19, the Written Examination will be held in two stages viz. Pre-qualifying Examination and Main Examination as elaborated below:-

8.1- Pre-qualifying Examination:

- (a) There shall be a Pre-qualifying single paper examination of 100 marks which shall have 100% Objective type Multiple Choice Question only.
- (b) The distribution of marks will be as under:

Technical subject	40 marks
General Knowledge including optional Questions on Official language Policy	30 marks
Establishment & Financial Rules	30 marks

Note : There shall be negative marking for incorrect answers. One-third of the marks allotted for each question will be deducted for every wrong answer. No corrections viz. cutting, overwriting, scoring off a ticked answer & ticking another answer, erasing, modifying the answer in any way will be permitted- Zero marks will be awarded in such cases of corrections.

8.2- Qualifying Marks:

The candidates scoring 75% marks and above in the Pre-qualifying Examination shall be eligible for appearing in the Main Examination and for this, number of candidates will be restricted to 5 times the number of respective vacancies in order of merit.

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8.3- Main Examination:

The Pre-qualifying Examination will be followed by one descriptive type paper on Professional Subject comprising of 100 marks and the qualifying marks in the written examination will be 60% and above.

- (9) Total marks and qualifying marks under the heading "Viva-Voce and Record of Service" are as under:-

Head	Maximum Marks	Qualifying Marks
Record of Service -	25	30, in which 15 marks for Record of Service will be essential.
Viva-voce test -	25	
	Total 50 marks	

- (10) The question paper will be bi-lingual, i.e both in Hindi and English. It will be candidate's choice to write in any one of these languages. The candidate should clearly indicate his/her choice of language in the space of the application format. If candidate writes in other than language indicated by him/her, such portion(s) of answer(s) shall not be evaluated.
- (11) A copy of syllabus of AEE/Gr. 'B' in Electrical Deptt. is enclosed as Annexure -'B' for wide circulation amongst the eligible candidates.
- (12) a) The Controlling Officers should give the wide publicity of this notification amongst the eligible staff under their control and ensure submission of applications by the candidates in the prescribed proforma (Specimen copy of format is enclosed as Annexure-'A').
- b) The last date for submission of the application by candidates is **18.09.2019**.
- c) The Controlling Officers are also advised that applications submitted by the candidates (in prescribed proforma) must be forwarded to concerned Personnel Branch/Unit office by **20.09.2019**.
- d) The applications should be scrutinized properly in Personnel Branch with the Service Record to avoid further complications. The applications should also be signed by the Controlling Officer with official seal and should have the counter signature of the concerned 'Personnel' Branch Officer to avoid any factual errors.
- e) All the scrutinized applications should be sent in a bunch through special messenger to Dy.CPO/Gaz. /ECR/ HJP on or before 26.09.2019 positively. Applications forwarded after the target date will not be entertained under any circumstances.

It may also be noted that application other than in prescribed proforma, having incomplete information or without signature of the candidates, duly signed by Controlling Officer and countersigned by Personnel Branch Officer will not be entertained and will be rejected summarily.

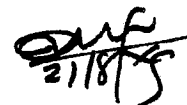
- (13) In case the service particulars furnished by the volunteers and certified to be in order by the concerned authority are found incorrect/false subsequently, the candidature of the volunteer will be liable to be cancelled at any stage and suitable departmental action will be initiated against him/her.

(14) **ACTION TO BE TAKEN ON RECEIPT OF APPLICATION BY CONCERNED PERSONNEL OFFICERS/CADRE CONTROLLING OFFICERS:-**

- a) The Personnel Officer/Cadre Controlling Officer will check the correctness of all the particulars of the applications with the Service Records and other relevant records and certify the correctness of each column of the application. Without such certification, application received will summarily be rejected and the responsibility will be fixed for incorrect or incomplete certification against the Officer who will certify/verify. The Personnel Officer/Cadre Controlling Officer should invariably write "Checked and verified " in each and every application after checking and verifying the details duly attesting their signature and date of certification (the date of certification should invariably put in the application).

In case, the Personnel/Cadre Controlling Officers do not put the date after certification or merely forward the application without checking and verifying the details, the matter would be brought to the notice of PCPO and concerned PHOD for taking action against him.

- b) It may please be noted that Controlling Officers/Heads of the Units have no discretion to entertain any application beyond the last date. The applications of the employees who are eligible, should only be forwarded after verifying the other relevant particulars and ineligible application should not be forwarded.


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- c) The Personnel Officer/Cadre Controlling Officer should forward the scrutinized and checked applications in one bunch together under one covering letter furnishing the details in the following proforma addressed to Dy.CPO/Gaz./HQ by 26.09.2019 indicating therein the total number of applications forwarded. (The details should be sent in soft copy in MS Excel format also). The applications rejected may be intimated to the individuals giving reasons thereof by the concerned Unit/Divn where lien and seniority of concerned staff held.

1	2	3	4	5	6	7	8	9	10		
Sl. No	Name of the employee	Desig.	DOB	DOA	Working Under	Community (UR/SC/ST)	Date of Regular promotion to Grade Pay		Total service in (GP Rs.4200/- (Rs.2400/- in case of L.P.S. II) & above in Elect. Deptt as on 13.04.19		
							GP 4200	GP 4600	Year	Month	Days

(15) TRAINING OF SC/ST CANDIDATES:-

It may be noted that before conducting the written examination, mandatory Pre-Selection Coaching of 3-4 weeks (21 working days) for eligible SC/ST candidates will be arranged by the department concerned in terms of Railway Board's letter No. E(MPP)96/3/23 dated 21.07.2000. PCEE/ECR/HJP is requested to nominate one JAG or above officer of Electrical Department as an In-charge of Pre-Selection Coaching for the SC/ST candidates. The In-charge of Pre-Selection Coaching will intimate the date and venue of the Pre-Selection Coaching to the eligible SC/ST candidates in due course.

If any SC/ST candidate refuse to undergo Pre-Selection Coaching, a written undertaking should be obtained from him/her and the same may be sent to Dy.CPO(Gaz.)/ECR/HJP as well as PCEE/ECR/HJP. The Controlling Officers will ensure that the SC/ST candidates under their control should be spared well in time without fail to participate in such coaching.

The SC/ST candidates may also be advised to insist their Controlling Officers, in their own interest to spare them for the said coaching.

(15.1) Duty of the In-charge of Pre-Selection Coaching (Nominated by PCEE):-

- (i) To inform in writing through special messenger to the concerned SC/ST employee with details of date, time & venue of coaching.
- (ii) To obtain in writing unwillingness for coaching (if any), from the concerned SC/ST employees.
- (iii) To arrange sparing of the candidates and liaison with respective Controlling Officers/Supervisors.
- (iv) To chalk out coaching schedule and adhere to it.
- (v) To ensure maintenance of daily attendance of SC/ST candidates on the attendance sheet, who attend the coaching.
- (vi) After completion of such coaching, the In-charge of the Pre-Selection Coaching will give a written report along with all supporting documents/papers including attendance sheet of SC/ST participants to Dy.CPO(Gaz) /ECR/HJP immediately after completion of Pre-Selection coaching for records and further action. On receipt of compliance report of Pre-Selection Coaching, written examination will be conducted.

(15.2) Duty of Controlling Officer:-

To spare the candidates under their control well in time without fail with direction to participate in the coaching.

(15.3) Duty of concerned SC/ST applicant:-

- (i) To manage their sparing from duty by insisting their Controlling Officers in their own interest.
- (ii) If any problem occurs in sparing, the candidate should report in writing to concerned in-charge of Pre-Selection Coaching on the same date. No representation will be entertained in case of failure to report to the concerned In-charge of Pre-Selection Coaching and it will be deemed for refusal for such coaching.


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- (iii) Failure of concerned SC/ST employees to avail Pre-Selection Coaching on any account including leave etc. will be considered on their part and will not entitle them to additional coaching classes.
- (iv) No appeal will be entertained by GM(P)/ECR/HJP after completion of Pre-Selection Coaching.
- (16) The eligible staff should also be advised that no supplementary written examination would be held for the absentees under any circumstances. As per rule, there is no provision of absentee exam in LDCE.
- (17) The controlling/authorized officer should ensure the issue of individual sparing letter/identity slip duly attesting specimen signature of the candidate on the sparing letter/identity slip. The candidates without proper sparing letter/identity slip will not be allowed to appear in the examination.
- (18) Concerned Personnel Branch Officer & Controlling Officers should ensure submission of service records and ACRs/APARs of last 05 years and DAR/Vig. clearance in respect of staff declared qualified for the viva-voce in due course/immediately after publication of the result of written examination through special messenger to this office.
- (19) Instructions and Master Circular No. 68 governing rules for promotion from Gr. 'C' to Gr. 'B' have been issued by Railway Board. The said master circular is available on website www.indianrailways.gov.in....>ministry of railway...>railway board> Directorate...>Establishment...>E(GP) Master Circular. The department/division/unit should ensure the compliance of instructions of item 15 of Master Circular 68.
- (22) Application received after the target date should not be entertained and the same should be disposed off at the Division /Extra Divisional level by rejecting them on account of late receipt under advice to this office.

Please acknowledge receipt.
Hindi Version will follow.

- DA :- i) Proforma of application (Annexure 'A')
ii) Syllabus (Annexure 'B')


3/18/19

(Dilip Paswan)
Sr. Personnel Officer /Gaz
For General Manager (P)

PROFORMA OF APPLICATION TO BE FILLED UP BY THE VOLUNTEER FOR SELECTION OF
AEE/Gr. ('B') AGAINST 30% QUOTA ATTACHED WITH THIS OFFICE NOTIFICATION NO.
ECR/HRD/GAZ/254/AEE(Gr.B)/30%/2019 Dated.- 21.08.2019

1. Full Name (in Block Letters) :-
2. Designation and station :-
3. Working under :-
4. Date of Birth :-
5. Date of appointment (Post with Grade pay and Department) :-
6. Divn/Unit where lien/seniority held :-
7. Dt. of Joining in Present lien/seniority unit :-
(Please mention :- Direct Rectt./Own request transfer/Mutual transfer/Administrative ground)-
8. PF/NPS No. :-
9. Educational Qualification :-
10. Whether the candidate belongs to SC/ST :-
Community (if yes, a copy of caste Certificate duly attested by a Gazetted Officer should be enclosed.)
11. Date of appointment/promotion to the following grade on regular basis (7th CPC) in Elect. Deptt. :-

Pay-Band & Grade-Pay	Date	Month	Year
(a) Level 4 in 7 th CPC (PB-II, GP- 2400 in 6 th CPC) (For Loco Pilot Shunting-II only)			
(b) Level 6 in 7 th CPC (PB-II, GP- 4200 in 6 th CPC)			
(c) Level 7 in 7 th CPC (PB-II, GP- 4600 in 6 th CPC)			

12. Length of non-fortuitous service (Regular Promotion) in the following grade in present lien/seniority unit (Elect. Deptt.) as on 13.04.19 .

Pay-Band & Grade-Pay	As on	Year	Month	Days
(a) Level 4 in 7 th CPC (PB-II, GP- 2400 in 6 th CPC) (For Loco Pilot Shunting-II only)	13.04.19			
(b) Level 6 in 7 th CPC (PB-II, GP- 4200 in 6 th CPC)	13.04.19			
(c) Level 7 in 7 th CPC (PB-II, GP- 4600 in 6 th CPC)	13.04.19			

13. Present pay scale & date of promotion to present scale/Grade Pay:-
14. Choice of language to answer the questions (English/Hindi). :-

DECLARATION OF THE CANDIDATE:-

- (i) I..... do hereby declare that, I have completed 05 years non-fortuitous Service in Pay Band Rs. 9300-34800 (PB-2) with Grade Pay Rs.2400/Rs.4200 and above in Elect. Department as on 13.04.2019 and also fulfilled other eligibility criteria of the said selection.
- (ii) I..... do hereby also declare that the above particulars furnished by me are true to the best of my knowledge and belief. I further undertake that any above entry is found incorrect or not in order, my candidature shall liable to be cancelled at any stage during pendency of the above selection.

SIGNATURE OF THE EMPLOYEE

Designation with Date
Mobile no. of employee

- (A) Forwarding the application (filled-up) submitted by the candidates to the Cadre Controlling Officer (Personnel Branch) by his /her controlling officer:-

The service particulars/Bio-data on the prescribed proforma filled-up by the Shri/Smt. _____ Designation _____ received within the target date is hereby forwarded to his/her respective Cadre Controlling officer (Personnel Branch) for verification with the service record and also for onward transmission to the GM(P)/ECR/HJP.

SIGNATURE OF CONTROLLING OFFICER
(With office seal & date)

- (B) Certificate to be furnished by the Cadre Controlling Officer (Personnel Branch):-

If the volunteer come under the circumstances mentioned in para 2(b) of the notification, the service rendered by immediate senior employee as on 13.04.19 should be indicated invariably in the following format.

No	Name (S/Shri) of immediate senior	Desig.	Pay Band (II) & GP	Year	Month	Day
			Level 4 in 7 th CPC (PB-II, GP- 2400 in 6 th CPC) (For Loco Pilot Shunting-II only)			
			Level 6 in 7 th CPC (PB-II, GP- 4200 in 6 th CPC)			
			Level 7 in 7 th CPC (PB-II, GP- 4600 in 6 th CPC)			

It is certified that the service particulars/Bio-Data furnished by Shri/Smt. _____ Designation _____ on the above proforma have been verified with his/her service record and found correct. The above mentioned candidate is eligible to appear in the said selection; accordingly the same is hereby forwarded to GM (P)/ECR /Hajipur for further necessary action.

SIGNATURE OF THE PERSONNEL OFFICER
(With office seal & Certification date)

Note : The application with any column unfilled will be summarily rejected.

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**PROFESSIONAL SUBJECT
PAPER-I (For Pre-qualifying Examination)**

Syllabus for Paper-I for 30% Group B examination for Electrical Department

- Network analysis, Star/Delta transformation, Symmetrical component, transients, Basics of Control systems.
- **Analog and Digital Electronics and Circuits:**
 1. 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.
 2. Small signal amplifiers, biasing circuits, frequency response and improvement, multi-stage amplifiers and feed-back amplifiers, D.C. amplifiers, Oscillators. Large signal amplifiers, coupling methods, push pull amplifiers, operational amplifiers and wave shaping circuits. Multi-vibrators and flip-flops and their applications. Digital logic gate families, universal gate combinational circuits for arithmetic and logic operation, sequential logic circuits. Counters, registers, RAM and ROMs.
- **Micro-processors:**
 1. Micro-processor architecture instruction set and simple assembly language programming. Interfacing for memory and I/O Applications of Micro-processors in power system.
- **Power Electronics:**
 1. Power and semi-conductor devices. Thyristor. Power transistor (IGBT), GTOs and MOSFETs. Characteristic and operation. AC to DC Convertors; 1-phase and 3-phase DC to DC Convertors; AC regulators. Thyristor controlled reactors, switched capacitor networks.
 2. Invertors; Single-phase and 3-phase. Pulse width modulation. Sinusoidal modulation with uniform sampling. Switched mode power supplies.
- **Communication Systems:**
 1. 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. Fibre optic cable communication system.
- **Logical reasoning.**
 1. The test is given to the candidates to judge their power of reasoning spread in verbal and non-verbal areas. The candidates should be able to think logically so that they perceive the data accurately, understand the relationships correctly, figure out the missing number of words, and to apply rules to new and different contexts. These indicators are measured through performance on such tasks as detecting missing links, following directions, classifying words, establishing sequences, and completing analogies.
- **Chart logic:**
 1. A chart or a table is given that is partially filled in and asked to complete it in accordance with the information given either in the chart/table or in the question.
- **Pattern perception:**
 1. Here a certain pattern is given and generally a quarter is left blank. The candidate is required to identify the correct quarter from the given four alternatives.

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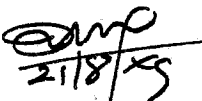
- **Figure matrix:**
 1. In this more than one set of figures is given in the form of a matrix all of them following the same rule. The candidate is required to follow the rule and identify the missing figure.

- **Rule detection:**
 1. Here a particular rule is given and it is required to select from the given sets of figures a set of figure which obeys the rule and forms the correct series.

- **General Services**
 1. General power supply arrangements, air conditioning etc.
 2. Power Supply: HT & LT sources, power supply network, substation layout, overhead & underground distribution, maintenance & operation of transformers, switch gears, protective devices & distribution lines.
 3. Construction, erection & commissioning of new sub station distribution lines, line calculations etc.
 4. House wiring, metering & safety precautions.
 5. Tariff & agreements, Relative merits of obtaining HT & LT supply, steps to reduce maximum demand, measurement of power, power factor, measuring demand etc.
 6. Water supply & requirement of water, planning of water supply system, sources of water, pipe line - frictional & other losses, discharge calculations.
 7. Reciprocating centrifugal & turbine pumps, relative merit, choice of VS & HS pumps, characteristic curve of pumps, efficiency drives, Electrical Connections & protections. Cavitation & priming of pumps, measurement of output with V-Notch & nozzle, necessity of multi stage pumping, storage capacity and purification of water.
 8. Preventive maintenance, special failure of pumps & motors, periodical overhaul.

- **Air-conditions and Refrigeration**
 1. Central air-conditioning plant & package type system, refrigeration cycle, air changes, planning for capacity and drives for refrigeration plants, refrigerants and ducting.
 2. Specification, design & testing of water coolers, central as well as package plants. Requirements of water coolers, window coolers & refrigerators.
 3. Standby arrangement: DG sets, both petrol & diesel as also diesel pumps for water supply arrangements. Operation, maintenance and overhauling.
 4. Illumination, yard lighting, street lighting & town supply network. Drives for workshop machinery.
 5. Earthing & Bonding.
 6. Commissioning & maintenance aspect of conventional & maintenance free earthing arrangement for general service application.
 7. Maintenance of various equipment of sub-station, energy management, important instructions issued by Railway Board & RDSO.
 8. Energy consumption, Renewable energy, Solar, Wind and biomass.

- **EMU/MEMU/Metros**
 1. Utility of EMU trains for urban and suburban services vis-a-vis locomotives, various types of EMU stock – AC, DC and AC-DC, their salient features, rake formation.
 2. Power circuits, auxiliary, control circuits, break systems, bogies and other mechanical components, their equipment, functioning, maintenance/overhauling schedules.
 3. Inspection schedules of EMU/MEMU/Metros, troubleshooting sequence.
 4. Safety precautions and fire prevention checks.
 5. Maintenance and overhaul organization and liaison with other departments.


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- Stores matters
 1. Procedure relating to procurement of stock items, non-stock items, distribution and Accountal of stores.
 2. Receipt and custody of stores.
 3. Sale of surplus stores.
 4. Inventory control.
 5. Schedule of powers.

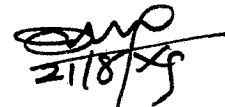
- Engineering Matters.
 1. Estimates.
 2. Execution of work.
 3. Contracts for work.
 4. Procedure for traffic and Engineering Survéys.
- Disaster Management – Role of Electrical Officer.

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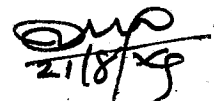
**PROFESSIONAL SUBJECT
PAPER-II (For Main Examination)**

Syllabus for Paper-II for 30% Group B examination for Electrical Department


- **Indian Elect. Acts & Rules:**
 1. Application of these to Railway working, Checks to be carried out before commissioning Elect. Assets, functions and duties of Electrical Inspectors (EIG), Electricity Act 2003. Energy Conservation Act 2007, ECB Code, role of Lift Inspector, Lift & Escalator Rules.
- **Electrical Engineering Materials**
 1. Band Theory, Conductors, Semiconductors 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. Insulating material classification/Thermal effect, Solar PV modules.
- **Theory and performance of Electrical Machines & Equipment**
 1. Basic concepts in rotating machines. EMF, torque, basic machine types. Construction and operation, leakage, losses and efficiency.
 2. Direct current machines : Generation of EMF, work, power, Torque equation, armature winding, armature, reaction, theory of commutation, Inter-poles & compensating windings, characteristics of shunts, series and compound generators, parallel running and load sharing of generators, Construction, Excitation methods. Circuit models characteristic and performance analysis. Generators and motors. Starting and speed control. Testing. Losses and efficiency.
 3. Synchronous machines. Construction. Circuit model. Operating characteristics and performance analysis. Synchronous reactance. Efficiency. Voltage regulation. Salient-pole machine. Parallel operation. Hunting. Short circuit transients.
 4. 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, 3 phase Asynchronous motors and induction motors for traction application.
 5. Transformers: Construction and testing. Equivalent circuits. Losses and efficiency. Regulation. Auto-transformer. 3-phase transformer. Parallel operation. Methods of cooling, Tap changing, parallel operation, polarity and phase sequence testing, protection Instruments, PTs & CTs, etc. Scott connection transformer.
- **Generation, Transmission & Utilisation**
 1. Sources of energy, heat value of fuel, steam power station, Hydro Electric Station, Nuclear Power Station. Pumped storage plants. Economics and operating factors.
 2. Power transmission lines. Modeling and performance characteristics. Voltage control. Load flow studies. Optimal power system operation. Load frequency control.
 3. 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.
 4. Power system transients. Power System Protection Circuit breakers. Relays. HVDC transmission.
 5. Illumination standards of light. Polar curve, Reflection and absorption, lighting calculations including design & economical layout of service building, workshops & yards. Various sources of light – fluorescent tubes etc.
 6. Electric traction : advantages & disadvantages, speed time curve – traction motor, starting & speed control of DC series motors, power consumptions, Regenerative braking, advantages and disadvantages of AC traction over DC traction, Tractive effort, Braking effort.
 7. Group & individual drive. Choice of drive & motors for various usages.
- **Measurements & instrumentation**
 1. Units and Standards. Error analysis. Measurement of resistance (high & low), Potentiometer, Wheat Stone & Kelvin bridge, meggers for insulation resistance & earth resistance.


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2. Voltmeters, ammeter, power factor meter, single phase watt meter, measurements of three phase power recording instruments, Maximum Demand Meter. Watt Hour Meter, Shunt, CT, PT.
3. Check meter
4. 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.
 - **Mechanical Engineering Refrigeration etc.**
1. Various types of drives, belt, tooth gearing, rope and chain drive and Helical gears. Different types of bearings, ball, roller etc.
2. Heat pump cycle, vapour compression, estimation of cooling and heating levels and plant capacities, calculation of psychometric charts, condensers, cooling and dehumidification, refrigerant and their properties.
 - **Traction distribution**
1. Systems of electrification in use. Advantages and disadvantages of the different systems with emphasis on 2 x 25 KV system.
2. Feasibility studies and justifications for track electrifications, preliminary planning and design, procedure followed in taking up electrification scheme, working drawing for execution of OHE wiring plans and OHE layout plans.
3. Planning of layout of overhead equipments, Techno economic survey for electrification of new lines, foot by foot survey, prepegging plans, precautions to be taken while wiring new lines, foundation & their types & use of wiring trains, final checking, safety checks and certification, energizing of new lines, principles of preparation of layout plans, provision of return conductors.
4. Overhead equipments – Types of overhead equipments, regulated and unregulated systems, stitches OHE, speed potential of various types of OHE; Centenary, contact wire, Dropper & Jumpers. Overlaps, clearances, Mast & portals, schedules of dimension etc.
5. Maintenance problems with OHE, Foot patrolling, current collection, use of tower wagons, ladders & ladder trolleys, seasonal & cycle checks, maintenance schedule, Insulator cleaning, straightening of out of plump masts, earthing and bonds, return conductors, Preventive maintenance tools; types of Blocks & Procedure.
6. Breakdown, TRD works during breakdowns and accidents, restoration procedure – both temporary and permanent.
7. Overhaul schedule & anti-theft measures.
8. Organization & working of maintenance depots, repair workshops, training of staff, safety measures and precautions.
 - **Power Supply Installation:**
1. Power supply arrangements, traction sub-stations, feeding stations, SSP & SPs, 132 KV transmission lines, Railway owned substations, transformer maintenance, circuit breakers, current and potential transformers, protective relays, auxiliary transformers, interrupters and isolators.
2. Liaison with power supply authorities, monthly meter reading, control over maximum demand, emergency power supply arrangements, Automated Meter Reading.
3. Maintenance of switching stations.
4. Remote control system, remote control equipment for AC substations and its working. Operation and maintenance of remote control; Specialized equipments for remote control work.
5. Remote control centre, traction power control organization, permit to work, emergency arrangements, coordination with operating and other departments, Liaison with supply authorities, emergency phones, safety precautions for electrified section.
6. Miscellaneous: Traction, stores and their accountal, regulation for electrical crossing of railway tracks.
7. Important instructions issued by Railway Board, RDSO's SMI/MS. TCs and related investigation reports.


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- **Train lighting and air conditioned coaches.**
 1. Designs, construction, principles of working, schematic circuit diagrams of train lighting equipments used in train lighting system.
 2. Coach wiring, under frame wiring, schedule of rewiring, couplers, lamp resistance, junction boxes and fuses, Generation to non-generation ratio, lights, fans and water raising apparatus.
 3. Self generating coaches, End on-Generation, Head on Generation, power cars, electrical and mechanical components, layout, operation and maintenance procedures for slip coaches.
 4. Train lighting batteries, their maintenance, defects, analysis of causes of failures and remedial measures.
 5. Simplified system of train lighting, use of alternators, anti-theft measures.
 6. Fire in trains, preventive measures and precautions.
 7. Periodic overhaul and heavy repairs to train lighting equipment.
 8. Broad outlines of types of equipments used in 110 V and 415 Volt air conditioned coaches, scheme of refrigerated vans. Drives and their problems, gear boxes, their maintenance and alignment.
 9. Maintenance schedules for AC coaches, partial AC coaches, AC I, II/III coaches, Sleeper coaches, Running Repairs.
 10. Coordination with Mechanical, Operating and Security Depart. Important instructions issued by Railway Board, RDSO's SMIs, TCs and related investigation reports.
- **Electric Locos**
 1. Description of locomotives in service, principles of operation and the characteristics of different types of locos used in Electric traction on the Indian Railways.
 2. Power, Auxiliary and control circuits: Their equipment, functioning, maintenance/overhauling schedules.
 3. Various types of bogies and bogie suspension and their components, power transmission from traction motor to axles, traction motor mounting arrangement ie, Jacqueman drive, Quill drive, WN coupler: their equipment, functioning, maintenance/overhauling schedules.
 4. Air, vacuum and Dual Break System, Air compressors, regenerative and rheostatic breaking, their equipment, functioning; maintenance/overhauling schedule.
 5. Function of electric loco sheds and electric loco workshops.
 6. Schedule inspection of locos ie. IA, IB, IC, AOH, IOH and POH.
 7. Records and Registers maintained in loco sheds, planning and progress organisation, statistical data, rolling stock organisation in sheds and shops, fire prevention, safety checks and history cards.
 8. Important instructions issued by Railway Board, RDSO's SMI/MS/TCs and related investigation reports, AC Traction Manual.
- **Electric loco and EMU operation**
 1. Operation of electric locos with single unit and multiple unit and with rheostatic and regenerative breaking.
 2. Safety features to be followed in the opeFailure of Electric locos and EMUs, their cause, investigation and remedial measures for avoiding failures.
 3. Inter-relation between electric, mechanical and operating department in functioning of electric locos and EMUS.
 4. Function of traction loco control organization.
 5. Preparation of engine links and driver links – power plan.
 6. Compilation of operating statistics for electric locos and EMUs operation.
 7. Outstation organization for maintenance of electric loco and EMU.
 8. Working rules for preparation/operation of Electric Rolling stock.
 9. Recruitment and training of running staff – conversion training etc.
 10. Accidents and re-railing technique of locos and EMUs.


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