**GOVERNMENT OF INDIA**
**MINISTRY OF RAILWAYS**
**(RAILWAY BOARD)**

**No. E(GP)2022/2/4** **New Delhi, dt:07/11/2022**

**The General Managers,**
**All Indian Railways/PUs.**

**(Kind Attn.:All PCPOs/PFAs/Dy.CPO(G) & Dy.CAO(G)**

**Sub.: Promotions to Group 'B' posts on Indian Railways - Introduction of Centralized Computer Based Multiple Choice Objective type examination (CBT) in all departments having Organised Services**

Board has prescribed syllabus for written examinations held as part of 30% LDCEs for promotion to Group 'B' posts in all Organised Services. Besides this, syllabus for 70% Selection for promotion to Group 'B' post of APO has also been prescribed by Board. Now, in the context of introduction of Centralised CBT for 70% Selections and 30% LDCEs for promotion to Group 'B' posts, Board has prescribed syllabus of 70% Selections and have also modified the syllabus for 30% LDCEs for all Group 'B' posts in Organised Departments. Similarly, syllabus for Establishment & Financial Rules has also been prescribed.

2. A copy each of the Syllabus for professional subjects prescribed by Board for 70% Selections and 30% LDCEs for promotion to Group 'B' posts in all Departments having Organised services along with the syllabus for Establishment & Financial Rules is enclosed for information. These syllabi are applicable for Selections & LDCEs to be conducted w.e.f.1.1.2023.

DA:As above

M Saluja 07/11/22

**(Meenakshi Saluja)**
**Dy. Director, Estt.(GP)-III**
**Railway Board**
**Ph. No. 233047250**
**E.mail ID- meena.1964@gov.in**

**Syllabus for promotion to Group- B posts - 70% selection and 30% LDCE.**

**Syllabus for Establishment Rules:**

1 Organization of the Personnel Department in Railways objectives functions and policies of Personnel Department.

2. Recruitment and Training, Classification of Services, Recruitment in Different services, Railway Recruitment Boards & Railway Recruitment Cells Compassionate Ground Appointments, Initial & In Service Training, Refresher Courses, Central Training Institutes, Training Centers in Zones, Divisions & Workshops, Training Modules for different posts, Training under Apprentices Act, Online Training, APARs.

3. General conditions of service in Railways, Seniority, Lien, Inter Railway & Inter Division transfers, Deputation, Promotion Policy & methods. Selection, Suitability, Trade Tests, Leave Rules, Pass Rules, Joining Time Reservation policy, HOER, Overtime, Payment of wages, current CPC Pay Rules, Advances in Railways.

4. Manpower planning, Rightsizing & Benchmarking, creation, extension and surrender of posts, creation of posts against new assets, different types of posts including workcharged posts.

5. The Railway Servants (Discipline & Appeal) Rules, 1968 and related instructions.

6. The Railway Services (Conduct) Rules, 1966 and related instructions.

7. Retirement benefits, qualifying service, pension, family pension, commutation gratuity, new pension scheme.

8. Staff welfare, SBF, Railway institutes, Railway schools, Ex-gratia payment, Incentive Bouns Scheme, Staff Grievances Redressal Mechanisms.

9. Industrial relations in Railways, recognized trade unions, industrial disputes. The Industrial Disputes Act, 1947. The Industrial Relations Code, 2020. The Trade Unions Act, 1926, PNM, PREM, JCM, Various Associations & Informal Meetings.

10. The Factories Act, 1948. The workmen’s Compensation Act, 1923. Functions of Labour Enforcement Officers, Right to Information Act.

11. The scope of Information Technology in Railway e – office. HRMS, IPAS , LIMBS, ARPAN, CPGRAMS, ANUBHAV etc.

**Syllabus for Financial Rules:**

1. Parliamentary Control over Railway Finance, Public Accountability, Cannons of Financial Propriety.

2. Railway Budget - Budgetary terms, Types of Budgets, Budget cycle, Demand of Grants, Budgetary and Financial Reviews.

3. Rules of Allocation - Classification of expenditure - Control of expenditure - Responsibility Accounting - Performance Budgeting - Exchequer Control - Financial Results of Working lines.

4. Works Programme - Financial justification of Works - Surveys - Preparation of Estimates - Capital Budget - Control over Capital Expenditure - Reappropriation of Funds.

5. Financial control over Stores Expenditure - Purchase and Stores Keeping Procedure - Inventory Control and ABC Analysis.

6. Financial & Cost Control in Railway *Wo*rkshops/Sheds/Units.

7. Rules and procedure relating to Tenders and contracts for execution of works and Procurement of Stores, M&P Programme and RSP.

8. Procedure for Possessing and finalizing Audit Objections and Draft Paras.

9. Delegation of Powers.

10. Losses, Frauds and Embezzlements.

11. General Financial Rules

12. Government e-Market (GeM)

13. Classification of Railway Revenue (Earnings)

14. Information Technology in general with specific reference to Railway's IT Applications
15. Taxation matters with special focus on GST & Income Tax

16. Organization of CGA and C&AG

17. Any other topic felt necessary from time to time

**SYLLABUS FOR 70% SELECTION AND 30% LDCE FOR GROUP 'B' POST OF ASSISTANT FINANCIAL ADVISER IN ACCOUNTS DEPARTMENT**

(i) **Professional Subject:**

General Principles of Govt. Accounting and Audit with Special Reference to Railways
Books and Budget including Traffic Book
Traffic Accounts and Statistics
Establishment
General Expenditure
Workshop Accounts
Stores Accounts

(ii) Management Accounting and Financial Justification for expenditure

(iii) General Financial Rules

(iv) Information Technology in general with specific reference to Railway's IT Applications.

(v) Taxation matters with special focus on GST & Income Tax.

(vi) Basic knowledge of the working of other Executive Departments including the technical terms.

(vii) Any other topic felt necessary from time to time.

# SYLLABUS FOR 70% SELECTION AND 30% LDCE FOR PROMOTION TO GROUP 'B' POST OF APO IN PERSONNEL DEPARTMENT

## 1. ROLE OF PERSONNEL DEPARTMENT IN RAILWAYS:

a) Organization, objectives and functions of Personnel Department.

b) Relevance and role of human resources with reference to current objectives, reforms and developments in IR.

c) Indian Railways Act, Establishment Codes & Manuals, Executive Orders of Railway Board.

## 2. RECRUITMENT:

a) Classification of Services and Categories;

b) General qualifications, conditions & rules for appointment; Medical fitness;

c) Safety, Non-safety & Essential Categories;

d) Modes of recruitment; Appointments on Compassionate Grounds, Sports quota, Cultural quota, Scouts & Guides quota; Substitutes, Contractual and Casual labour;

e) Railway Recruitment Boards & Railway Recruitment Cells;

f) Reservation in Recruitment.

## 3. GENERAL CONDITIONS OF SERVICE IN RAILWAYS:

a) Appointment, Seniority & Lien;

b) Pay Fixation Rules, Pay Structure, Pay Bills and related rules & procedures;

c) All types of Allowances (including those to Running Staff), Advances (loans) & Recoveries;

d) Promotion rules & eligibility; AVCS, ACP/MACP/DACP;

e) Procedures of Selection, Suitability and Trade Tests;

f) Sealed Cover procedure; Next Below Rule; Refusal of promotion;

g) Rules of Transfer (Inter Railway & Inter Divisional);

h) Deputation;

i) Types of Leave; Rules & Joining Time; Encashment of leave;

j) Pass Rules; AILTC;

k) Reservation policy for SC, ST, OBC, PwBD, ESM & EWS; rules and rosters;

l) HOER;

m) PME & Mandatory Health Check-up;

n) Medical decategorisation and absorption of medically de-categorized staff in alternative posts.

## 4. HUMAN RESOURCES MANAGEMENT:

a) Overall Earning & Expenditure, including staff expenditure, Operating Ratio;

b) Manpower planning; Book of Sanctions & Scale-check;

c) Supernumerary posts & Redeployment;

d) Surrender, Creation, Extension & Transfer of posts; Vacancy Bank after POSP;

e) Work-study & Job Analysis; Bench-marking & Right-sizing; Yardsticks;

f) Duty Rosters; Link Diagram; Crew Link & Power Plan;

g) Work-charged posts;

h) Initial & In-Service Training, Refresher Courses; On-the-job Training, Multi-skilling, Future Training needs & systems;

i) Central Training Institutes, Training Centres in Zones, Divisions & Workshops; Plan Head 65

j) Training Modules for different posts,

k) Training under Apprentices Act, Online Training,

l) Performance Appraisal - APARS & SPARROW.

m) Mission Karmayogi; Rail Kaushal Vikas Yojana, etc

## 5. INDUSTRIAL RELATIONS, POLICIES & LABOUR LAWS:

a) Formal & informal interaction with recognised trade unions and associations;

b) PNMs, Staff Councils & PREM at various levels;

c) Role of JCM and Labour Tribunals & Labour Commissioner;

d) Facilities and privileges to trade unions & associations.

e) Related Industrial & Labour Laws – PLB; The Industrial Disputes Act, 1947; The Industrial Relations Code, 2020; The Trade Unions Act, 1926; The Factories Act, 1948; The Employee's (Workmen's) Compensation Act, 1923; Minimum Wages Act, 1948; Contract (Regulation & Abolition) Labour Act, 1970; Payment of Wages Act; Industrial Relations Codes 2020; Sexual Harassment of Women at Workplace (Prevention, Prohibition & Redressal Act 2013).

## 6. STAFF WELFARE:

a) Staff Grievances Redressal Mechanisms;

b) SBF, Railway Institutes, Railway schools & colleges, scholarships,

c) Ex-gratia payment,

d) Incentive Bonus Scheme;

e) Sports Incentives & cultural competitions, extra-curricular activities;

f) Excursions, tours and holiday camps; co-operative Societies;

g) Medical assistance;

h) Quarters – types, allotment & retention rules.

**7. DISCIPLINE & APPEAL RULES:**

a) The Railway Services (Conduct) Rules, 1966 & related instructions - scope and Implementation.

b) The Railway Servants (Discipline & Appeal) Rules, 1968 & related instructions; Schedule of Power; procedures, application and implications.

**8. FINAL SETTLEMENT:**

a) Retirement rules, types & benefits;

b) Old and New Pension schemes; Final Settlement rules under various circumstances;

c) Qualifying Service;

d) Pension & Family Pension, Provident Fund Rules;

e) Commutation, Gratuity, GIS, Leave Salary;

f) Other-than-Normal Retirement (ONR) cases;

g) ARPAN, Pension Adalats & Pensioners' Associations & representations;

h) RELHS & post-retirement benefits

**9. IT APPLICATION PLATFORMS:**

a) Use of e-Office, HRMS, HR-MIS, IPAS, SPARROW, LIMBS, ARPAN, CPGRAMS, ANUBHAV, UMID, RESS, GEM, etc;

b) Future of IT in Personnel Management.

**10. REPRESENTATIONS & COURT CASES:**

a) Service Law;

b) Handling legal cases (in CATs and Courts);

c) RTI & CIC matters; other statutory commissions / bodies;

d) CPGRAMS, CA(iii) References, etc.

**11. Official Language Policy and Official Language Rules.**

**12. Any other matter related to any of the above-mentioned topics.**

# SYLLABUS FOR 30% LDCE FOR PROMOTION TO GROUP 'B' POST OF AMM/ADMM IN STORES DEPARTMENT

**Part-A**

## Professional Subject

1 Organization of Stores Dept. on Zonal Railway & Production Units.

2 Objectives of Stores Dept. in brief.

3 Functions of the Principal Chief Material Manager (PCMM) & other officers assisting him.

4 Cannons of Financial Propriety & its application to Stores Matters.

5 Delegation of Powers:

- i) Its need & necessary safeguards
- ii) Powers of PCMM & other officers for;

(a) Purchase, (b) Sale, (c) Write off, (d) Other misc. matters

6 Purchase of stores:

- i) Important Stages in purchase cycle
- ii) Purchase Policy & Rules of IR and GFR Provisions
- iii) Channels & Procedures of purchase of indigenous stores
- iv) Modes of tendering [including PAC purchase] & their limitations
- v) Tender consideration;
  - a) Price determination (Reasonability/Workability)
  - b) Negotiations, Cartel Formation & related instructions
  - c) Concept & constitution of Tender Committee
- vi) Purchase of M&P/RSP items including CMC
- vii) Emergency Purchases
- viii) Basics of iMMS & e-Procurement
- ix) Procedures/Manuals related to iMMS and IREPS
- x) Procurement through GeM
- xi) Reverse auction
- xii) Price variation clause and its operation
- xiii) Buy back system of purchase
- xiv) Green procurement/Sustainable procurement
- xv) Composite contracts and strategic procurement

7 Purchase through Centralized agencies like:

Railway Board, BLW, CLW, etc.

8 Procedure of purchase from other Govt. Dept. in brief

9 Govt. Policy of Preference:

- a) Purchase/Price Preference
  - i) Micro & Small Enterprises
  - ii) Items reserved for procurement from MSEs
- b) Purchase Preference as per Make in India Policy.
- c) Special benefits available to MSEs

10 Supply Contracts:

i) Important provisions of Indian Contract Act, Sale of Goods Act and GST Act
ii) IRS Conditions of Contract, General Conditions of Contract
iii) Force Majeure Clause
iv)Preparation of bid documents, special conditions, price variation and eligibility criterion etc for
a) Rate/Running & Fixed quantity/Long term contracts
b) Service Contract
c) Annual maintenance Contract
d) EPC Contract
v) Online submission of EMD & SD
vi) PO Draft/Numbering Scheme & vetting considerations
vii) Contract Management
(a) Extension of DD/Modification of PO
(b) Penalties for breach of contracts (LD, GD, RP)
viii) Settlement of Disputes
a) Arbitration Clause in IRS Conditions
b) Arbitration & Conciliation Act 1996 including Amendment Act, 2019
c) Dispute resolution between two Govt. Deptt. Or (CPSU)

11 Import of Material:
i) Direct import by Zonal Railways/Production Units
ii) Import through Railway Board
iii) Types of Import Contracts: FOB, CFR, CIF & DDP etc.
iv) Modes of Payment, Letter of Credit & its types
v) Sea & Air freighting of Railway Materials & Insurance Covers
vi) Port clearance of imported consignments
vii) Claims settlement
viii) INCOTERMS (latest edition)

12 Strategic Sourcing (Rational Source Selection):
a) Registration of firms on Railways and IREPS
b)Vendor performance evaluation; Vendor rating; Penal Action against vendors; Alternatives available with Railways, PUs
c) Registration by RDSO
d) Supply chain concept — relevance to Railways especially PUs

13 Important Statistics on Stores matters:
a) Submitted to Railway Board, periodically
b) Included in Railway Board's annual report & GM's Narrative Report
c) Yardsticks to measure efficiency of Stores Dept.

14 Stores Budget:
a) Compilation & various review/amendments to the budget during the financial year
b) Controls to adhere to the budget provisions, Exchequer control
c) Control over stores expenditure to minimize working expenses
d) Purchase Grant
e) Zero Base Budgeting (ZBB)

15 ISO Certification/ 5S Certification/ 6 Sigma Certification:

Procedure for obtaining the certification & subsequent compliance for continuation of the same:
a) For Purchase Office,
b) For stores depot

16 Paperless Working:
a) e-Office
b) Digitally signed electronic reports in iMMS and IREPS

17 Online acceptance of tenders:
Technical Scrutiny, Tender Committee Minutes preparation& Tender acceptance/Direct acceptance, Letter of Acceptance generation and auto-generation of Purchase order.

18 Procedure for keeping/retention/destruction of official records.

19 Stores Depots:
a) Location
b) Functions
c) Typical Layout of a stores depot

20 Design Aspects of a Typical Stores Depot/Warehouse:
a) Important parameters to be considered for design
b) Space Management
i) Buildings, Yards, Roads
ii) Various types of storage arrangements

c) Materials Handling:
i) Equipments
ii) Unit piling, container/pallet systems
iii) Vertical storage system
d) Important Fire Safety aspects & Latest fire fighting Techniques
e) Security Arrangements to prevent & action called for by the Depot Officer in case of incidence of the following:
i) Theft
ii) Pilferage
iii) Misappropriation
iv) Provision of CCTV in Stores Depots/Divisional Depots
f) Procedure for locking & sealing of wards/go-downs in a depot and depositing/collecting the keys
g) Gate Pass

21 Depot Organization:
a) Functions/Responsibilities of Depot Officer & Subordinate Staff
b) Various sections of stores depot, its functions & working procedures

22 Receipt & Accountal of materials:
a) Procedure for receipt & accountal, in a depot
b) Consequent clearance of purchase suspense
c) Accounts checks on suppliers' bills
d) Purchase Suspense/Sales Suspense

23 Inspection of Stores:

a) Inspection Techniques
b) Various Agencies for Inspection of Railway Materials
c) Acceptance of material against WTC
d) Inspection at firm's premises & Inspection at Depot
e)Rejection of pre-inspected materials and procedure for joint inspection
f) Disposal of rejected materials
g) Warranty Claim Procedure

24 Sampling for Inspection:

a) Sampling Methods
b) Indian Standards relating to Sampling

25 Testing Methods of common materials used by Railways like Steel, Rubber, PVC Items, Rexin, Oils, Paints, Non-ferrous items.

26 Receipt & Issue of Stores on iMMS:

a) FIFO Method of Receipt and Issue
b) Procedure of issue of materials from stores depot to consumers other than attached workshops & debiting the indentors for stores issued

27 Properties & Preservation of stores such as: Rubber Items, chemicals, electrodes, timber, explosive/inflammable items, etc.

28 Imprest Stores:

a) Procedure for issue and supply of Imprest Stores
b) Road contract and its Management

29 Returned Stores through iMMS:

a) Its receipt & accountal in the depot
b) Valuation of returned stores
c) Monthly Credit Summaries

30 Sale of Railway Materials:

a) SAG Committee Recommendations
b) Survey Committee & its functions for various categories of stores
c) Procedure for condemnation of an asset (M&P items including Motor Vehicle)
d) Procedure for sale by tender
e) Procedure for disposal of scrap by e-auction
f) General & Special conditions of sale
g) On-line payment of BSV
h) On-line payment of EMD
i) Payment Gateway

31 Purchase by Depot/Divisional Officers:

a) Purchase Powers- Local & Cash Purchases
b) Digital recoupment of cash imprest

32 Important Components & its usages:
In carriages, wagons, diesel loco, electric loco, Metro coaches, TRD & DMU/EMUs

33 Dispatch of Railway Materials:
a) By Rail, Road
b) By Sea & Air
c) Safeguards against loss/damage in transit
d) Settlement of claims with carriers

34 Inter-depot transfers & Clearance of SINT suspense

35 Stock Verification:
a) By Accounts
b) Departmental
c) Disposal of Stock Sheets

36 Classification of Heads of Accounting & Various Suspense Heads relating to Stores

37 Codification:
i) Stores nomenclature & price lists (Unified & Non-unified)
ii) Unified Vendor Code
iii) Consignee Code
iv) Advantages of codification

38 Standardization & Variety reduction

39 Provisioning & Recoupment of Stores:
a) Maxima Minima Method
b) Annual Review Method
c) Main Depot-Sub depot arrangement
d) Economic Order Quantity (EOQ)
e) Lead time & Safety/Buffer Stock
f)Computerized forecast of demand/consumption for stock-recoupment (Generation of Estimate Sheet)
g) Various forecasting statistical techniques

40 Inventory Management:
a) Types of inventories
b) Various Inventory models:
i) The Basic (EOQ) Model: Constant Demand & Lead Time
ii) Variable Demand but constant Lead Time
iii) JIT Inventory Model
c)Computer as an aid to inventory control & inventory management
d) Inventory reports in iMMS & its use for inventory control

e) Selective Control Techniques:
i) ABC, VED, FSN & XYZ analysis for inventory control & improvement in service levels

ii) Related multi-criteria matrix

f) Inventory performance indices on IR

g) Over stock, Inactive & Surplus Stores:

i) Definitions

ii) Reasons for accrual & its disposal

iii) Steps for prevention

41 Computerized Price Ledgers:

a) Preparation of Price Ledgers: Role of Stores Depot

b) Book Average Rates

c) Debiting the indentors for cost of materials issued & preparation of Debit Summaries

42 Audit:

Narrative Reports, Special Letters, Factual Statements, Draft Paras & its disposal.

43 Accounts:

Accounts Objections, Special Reports, Stock Sheets, Inspection Reports Pt I & II.

44 M&P, RSP and Works Program

45 Features of MS-Word, Excel, PPT

46 Exception Reports and Action Documents generated on iMMS.

47 Computerisation of User Depot and Integration with iMMS/IREPS (User Depot Module)

# SYLLABUS FOR 70% SELECTION FOR PROMOTION TO GROUP 'B' POST OF AMM/ADMM IN STORES DEPARTMENT

**Part-A**

## Professional Subject

1 Organization of Stores Dept. on Zonal Railway & Production Units.

2 Objectives of Stores Dept. in brief.

3 Functions of the Principal Chief Material Manager (PCMM) & other officers assisting him.

4 Cannons of Financial Propriety & its application to Stores Matters.

5 Delegation of Powers:

i) Its need & necessary safeguards
ii) Powers of PCMM & other officers for:
(a) Purchase, (b) Sale, (c) Write off, (d) Other misc. matters

6 Purchase of stores:

i) Important Stages in purchase cycle
ii) Purchase Policy & Rules of IR and GFR Provisions
iii) Channels & Procedures of purchase of indigenous stores
iv) Modes of tendering [including PAC purchase] & their limitations
v) Tender consideration;
a) Price determination (Reasonability/Workability)
b) Negotiations, Cartel Formation & related instructions
c) Concept & constitution of Tender Committee

vi) Purchase of M&P/RSP items including CMC
vii) Emergency Purchases
viii) Basics of iMMS & e-Procurement
ix) Procedures/Manuals related to iMMS and IREPS
x) Procurement through GeM
xi) Reverse auction
xii) Price variation clause and its operation
xiii) Buy back system of purchase
xiv) Green procurement
xv) Composite contracts and strategic procurement

7 Purchase through Centralized agencies like:
Railway Board, BLW, CLW, etc.

8 Procedure of purchase from other Govt. Dept. in brief

9 Govt. Policy of Preference:

a) Purchase/Price Preference
    i) Micro & Small Enterprises
    ii) Items reserved for procurement from MSEs
b) Purchase Preference as per Make in India Policy
c) Special benefits available to MSEs

10 Supply Contracts:

i) Important provisions of Indian Contract Act, Sale of Goods Act and GST Act
ii) IRS Conditions of Contract, General Conditions of Contract
iii) Force Majeure Clause
iv) Preparation of bid documents, special conditions, price variation and eligibility criterion etc for
    a) Rate/Running & Fixed quantity/Long term contracts
    b) Service Contract
    c) Annual maintenance Contract
    d) EPC Contract
v) Online submission of EMD & SD
vi) PO Draft/Numbering Scheme & vetting considerations
vii) Contract Management
    (1) Extension of DD/Modification of PO
    (2) Penalties for breach of contracts (LD, GD, RP)
viii) Settlement of Disputes
    a) Arbitration Clause in IRS Conditions
    b)Arbitration & Conciliation Act 1996 including Amendment Act, 2019
    c) Dispute resolution between two Govt. Deptt. Or (CPSU)

11 Import of Material:

i) Direct import by Zonal Railways/Production Units
ii) Import through Railway Board
iii) Types of Import Contracts: FOB, CFR, CIF & DDP etc.
iv) Modes of Payment, Letter of Credit & its types
v) Sea & Air freighting of Railway Materials & Insurance Covers
vi) Port clearance of imported consignments
vii) Claims settlement
viii) INCOTERMS (latest edition)

12 Strategic Sourcing (Rational Source Selection):

a) Registration of firms on Railways and IREPS
b)Vendor performance evaluation; Vendor rating; Penal Action against vendors; Alternatives available with Railways, PUs
c) Registration by RDSO
d) Supply chain concept — relevance to Railways especially PUs

13 Important Statistics on Stores matters:

a) Submitted to Railway Board, periodically
b) Included in Railway Board's annual report & GM's Narrative Report

c) Yardsticks to measure efficiency of Stores Dept.

14 Stores Budget:

a) Compilation & various review/amendments to the budget during the financial year
b) Controls to adhere to the budget provisions, Exchequer control
c) Control over stores expenditure to minimize working expenses
d) Purchase Grant
e) Zero Base Budgeting (ZBB)

15 ISO Certification/ 5S Certification/ 6 Sigma Certification:

Procedure for obtaining the certification & subsequent compliance for continuation of the same:

a) For Purchase Office,
b) For stores depot

16 Paperless Working:

a) e-Office
b) Digitally signed electronic reports in iMMS and IREPS

17 Online acceptance of tenders:

Technical Scrutiny, Tender Committee Minutes preparation& Tender acceptance/Direct acceptance, Letter of Acceptance generation and auto-generation of Purchase order

18 Procedure for keeping/retention/destruction of official records

19 Stores Depots:

a) Location
b) Functions
c) Typical Layout of a stores depot

20 Design Aspects of a Typical Stores Depot/Warehouse:

a) Important parameters to be considered for design
b) Space Management
    i) Buildings, Yards, Roads
    ii) Various types of storage arrangements
c) Materials Handling:
    i) Equipments
    ii) Unit piling, container/pallet systems
    iii) Vertical storage system
d) Important Fire Safety aspects & Latest fire fighting Techniques
e) Security Arrangements to prevent & action called for by the Depot Officer in case of incidence of the following:

    i) Theft
    ii) Pilferage
    iii) Misappropriation

iv) Provision of CCTV in Stores Depots/Divisional Depots

f) Procedure for locking & sealing of wards/go-downs in a depot and depositing/collecting the keys

g) Gate Pass

21 Depot Organization:

a) Functions/Responsibilities of Depot Officer & Subordinate Staff

b) Various sections of stores depot, its functions & working procedures

22 Receipt & Accountal of materials:

a) Procedure for receipt & accountal, in a depot

b) Consequent clearance of purchase suspense

c) Accounts checks on suppliers' bills

d) Purchase Suspense/Sales Suspense

23 Inspection of Stores:

a) Inspection Techniques

b) Various Agencies for Inspection of Railway Materials

c) Acceptance of material against WTC

d) Inspection at firm's premises & Inspection at Depot

e)Rejection of pre-inspected materials and procedure for joint inspection

f) Disposal of rejected materials

g) Warranty Claim Procedure

24 Sampling for Inspection:

a) Sampling Methods

b) Indian Standards relating to Sampling

25 Testing Methods of common materials used by Railways like Steel, Rubber, PVC Items, Rexin, Oils, Paints, Non-ferrous items

26 Receipt & Issue of Stores on iMMS:

a) FIFO Method of Receipt and Issue

b) Procedure of issue of materials from stores depot to consumers other than attached workshops & debiting the indentors for stores issued

27 Properties & Preservation of stores such as: Rubber Items, chemicals, electrodes, timber, explosive/inflammable items, etc.

28 Imprest Stores:

a) Procedure for issue and supply of Imprest Stores

b) Road contract and its Management

29 Returned Stores through iMMS:

a) Its receipt & accountal in the depot

b) Valuation of returned stores

c) Monthly Credit Summaries

30 Sale of Railway Materials:

a) SAG Committee Recommendations
b) Survey Committee & its functions for various categories of stores
c) Procedure for condemnation of an asset (M&P items including Motor Vehicle)
d) Procedure for sale by tender
e) Procedure for disposal of scrap by e-auction
f) General & Special conditions of sale
g) On-line payment of BSV
h) On-line payment of EMD
i) Payment Gateway

31 Purchase by Depot/Divisional Officers:

a) Purchase Powers- Local & Cash Purchases
b) Digital recoupment of cash imprest

32 Important Components & its usages:

In carriages, wagons, diesel loco, electric loco, Metro coaches, TRD & DMU/EMUs

33 Dispatch of Railway Materials:

a) By Rail, Road
b) By Sea & Air
c) Safeguards against loss/damage in transit
d) Settlement of claims with carriers

34 Inter-depot transfers & Clearance of SINT suspense

35 Stock Verification:

a) By Accounts
b) Departmental
c) Disposal of Stock Sheets

36 Classification of Heads of Accounting & Various Suspense Heads relating to Stores

37 Codification:

i) Stores nomenclature & price lists (Unified & Non-unified)
ii) Unified Vendor Code
iii) Consignee Code
iv) Advantages of codification

38 Standardization & Variety reduction

39 Provisioning & Recoupment of Stores:

a) Maxima Minima Method
b) Annual Review Method
c) Main Depot-Sub depot arrangement
d) Economic Order Quantity (EOQ)

e) Lead time & Safety/Buffer Stock

f) Computerized forecast of demand/consumption for stock-recoupment (Generation of Estimate Sheet)

g) Various forecasting statistical techniques

40 Inventory Management:

a) Types of inventories

b) Various Inventory models:

i) The Basic (EOQ) Model: Constant Demand & Lead Time

ii) Variable Demand but constant Lead Time

iii) JIT Inventory Model

c) Computer as an aid to inventory control & inventory management

d) Inventory reports in iMMS & its use for inventory control

e) Selective Control Techniques:

i) ABC, VED, FSN & XYZ analysis for inventory control & improvement in service levels

ii) Related multi-criteria matrix

f) Inventory performance indices on IR

g) Over stock, Inactive & Surplus Stores

i) Definitions

ii) Reasons for accrual & its disposal

iii) Steps for prevention

41 Computerized Price Ledgers:

a. Preparation of Price Ledgers: Role of Stores Depot

b. Book Average Rates

c. Debiting the indentors for cost of materials issued & preparation of Debit Summaries

42 Audit:

Narrative Reports, Special Letters, Factual Statements, Draft Paras & its disposal.

43 Accounts:

Accounts Objections, Special Reports, Stock Sheets, Inspection Reports Pt I & II.

44 M&P, RSP and Works Program

45 Features of MS-Word, Excel, PPT

46 Exception Reports and Action Documents generated on iMMS.

47 Computerisation of User Depot and Integration with iMMS/IREPS (User Depot Module)

**Syllabus for 70% Selections for promotion to Group 'B' posts of AEE in Electrical Department.**

## A. Professional Subjects:

### Part I: General Electrical Engg.

1. Electrical Circuits: Electrical Circuit Elements (Resistance, Inductance and capacitance), Voltage and Current Sources, Ohm's law, Kirchoff's Voltage and Current Laws, DC & AC circuit analysis.

2. Electronic Devices & Analog Electronics: Semiconductor Diodes, Diode Rectifiers, Bipolar Junction Transistor, JFET, MOSFET, Transistor Biasing Circuits.

3. Power Electronics: Characteristics and comparison of Power Diodes, BJTs, Thyristors, SCR, GTO, IGBT and Power MOSFET. One phase and Three phase uncontrolled and controlled rectifiers, Features and working of Variable Voltage Variable Frequency (VVVF) drives and its applications.

4. Electrical Engg. Materials: Properties & applications of Electrical insulating materials, Magnetic materials, Conducting materials & Semiconducting materials.

5. Electrical Machines: DC Machines, Induction Machines and Synchronous Machines. Losses in rotating machines. Single phase and three phase transformers. Losses and efficiency of transformers, Machine Drives.

6. Renewable Energy Sources: Climate change, Global warming, Various sources of Renewable energy- Resources and applications, Solar Cells, Rooftop solar and land based solar plants- Concepts of Basic Design, construction and maintenance, Off grid and Grid connected solar plants, Wind turbines, Net Zero carbon emission, ECBC, Round the clock green energy, Energy Storage systems, Policies and regulations , Net and Gross metering, Business model, tendering.

7. Power System and Protection: Basic concepts of electrical power generation and various equipment. Concepts of transmission lines, cables, Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per-unit quantities, Circuit breakers, Concept of protection.

### Part II: Railways Electrical Engg.

**1. General Services:**

a. Power Supply arrangement: Radial distribution system, Looped(Ring Main )
b. distribution systems. Layout & Equipment at Distribution sub-station. Operation & Maintenance of sub-station, Various testing at sub-station, overhead & underground distribution, protective devices & their coordination. Construction, erection & commissioning of new sub-station and distribution lines. Basic features of PVC and
c. XLPE cables. Cable rating and derating, Cable laying. Concept of average

demand, peak demand, load factor & electrical billing. Power factor improvement, Electrical & fire safety, Safety auditing of sub-station, concept of energy audit, Functions of Electrical Inspector to Government (EIG) in Railways. Power line crossing, Electricity Act-2003, CEA Regulations, SCADA and Substation automation. Earthing arrangement.

d. Building Electrification: Types of various wiring methods, metering & safety measures. Wire, switchgears & fittings used for wiring, Energy efficient appliances, scale of fittings as per policy in various types of quarters, various types of Tariffs, commercial connection, concept of prepaid and postpaid metering, concept of smart meters. Safety coordination, Electrical accidents and prevention.

e. Illumination & Lighting: Various parameters related to illumination, Different types of illumination sources, lighting methods, classification of lux levels at various types of stations, yard lighting & street lighting. Passenger amenities at Railway stations.

f. Water supply: Types of water supply system, Pumping system, Classification of pumps, Comparison of various pumps, fluid theory, discharge calculations. Centrifugal pump, turbine pump, Submersible pumps, characteristic curve of pumps, efficiency. Cavitations & priming of pumps, necessity of multistage pumping, storage capacity and purification of water. Installation, maintenance & troubleshooting of pumps, Starter & drives of pumps, automation of pumps.

g. Lift & Escalator: Working of Lift & Escalator, Installation of Lift and Escalator. Maintenance, various safety devices, control panels & Safety aspects.

h. Air Conditioning & Refrigeration: Theory of air conditioning, refrigeration cycles, various types of refrigerants, window/split/package AC unit. Central air conditioning plant, VRF system, air cooling systems, planning for capacity and drives for refrigeration plant, Maintenance and troubleshooting.

i. Energy Conservation: Need of conservation of energy, Various measures being taken by railways to conserve energy in the field of Electrical General Services. Necessity and implementation of Open Access in Indian Railways. Energy conservation Act.

2. **Traction distribution:**

a. OHE: Basic design concepts of TRD system of conventional and 2x25kV system. Types of overhead equipment. Sectioning principles of OHE. Various parts of OHE. Foot Patrolling, current collection, Tower wagons, seasonal & cyclic checks, maintenance Schedule, Preventive maintenance Tools, failure investigation of OHE, earthing and bonding. Railway Electrification and process of construction. Power Blocks & Procedure to obtain it.

b. PSI: Schematics of 1x25kV and 2x25kV traction substation with names/ratings of various equipment, protection scheme for TSS. Fixed and dynamic PF correction, Feeding stations, SSP & SPs, 132 kV transmission lines, PSI equipment.

Maintenance and failure investigation of PSI equipment.

c. SCADA and Miscellaneous items: Operation and maintenance of remote control, traction power control organization, permit to work, emergency arrangements, coordination with operating and other departments. Liaison with supply authorities, maintenance and failure investigation of SCADA equipment.

d. NDT techniques, Open Access, safety precautions for electrified sections, Latest development in TRD, MSG meetings. Instructions issued by Railway Board, RDSO's TI/MI, TCs, IRSOD & ACTM.

**3. Train Lighting and AC Coaches**:

Systems of Train Lighting and Air conditioning on coaches, Self Generating Coaches, ICF TL/AC Coach Generation system. Equipment, circuits and protection in ICF TL/AC coaches. Emergency feed extension in coaches. EOG and HOG systems in coaches - Hotel Load converter and Interlocking panel. Equipment, power circuits and protection systems in LHB TL/AC coaches, Power car and Pantry car. Air Conditioning in ICF/LHB coaches, Heat Load Calculation, Precooling, Pulldown and Dynodrive tests. Maintenance schedules of ICF and LHB coaches. Duties of ACCM/ACCA. Pre-cooling of AC Coaches. Fire causes and prevention measures in coaches. SMIs, Modification Sheets and Technical circulars issued by RDSO and instructions by Railway Board and RDSO.

**4. Electric Locos:**

Organizational structure and duties of officers & staff. Conventional AC & 3 phase locomotives on IR. Equipment in locomotives, their functioning / operations, maintenance / overhauling and testing parameters & maintenance schedules. Reliability & safety action plans. Traction Power Circuit, Auxiliary Circuit, Control Circuits and Pneumatic Circuits. Different types of braking arrangements. Locomotive maintenance schedules & various tests to be carried out. Working of Electric Loco Shed & Electric Loco Workshop. Safety items and safety checks involved in safe locomotive operation. Relevant paras of ACTM, Accident Manual, G&SR, IR SOD and Instructions issued by Railway Board, RDSO and CLW. Latest developments in the field of electric locomotives.

**5. EMU and MEMU/Metros:**

Concept of EMU/MEMU/Metro trains, various types of EMU/MEMU stock, Conventional & 3 phase EMUs & their salient features. Different types of brakes used in EMU/MEMU/Metros. Power circuits, auxiliary, control circuits. Mechanical components and its functions. Different electrical equipment and its functions. Inspection/Maintenance/Overhauling schedules of EMUs/MEMU/Metros. Safety precautions and fire prevention in EMU/MEMU/Metros. Train Control Management System(TCMS). Recent developments in EMU/MEMU/Metros.

**6. Electric Loco and EMU Operation:**

Organizational structure and duties of officers & staff. Crew management – Training, Monitoring & Counseling. Crew & loco links. HOER & Duty Rules. Loco utilization. SPAD (Signal Passing At Danger). Management of Crew lobby, running room, trips shed & TLC / Power controller office. Working of CMS & FOIS. Safe, punctual & efficient loco / EMU operation with online troubleshooting of locomotive / EMU failures. Relevant paras of ACTM, Accident Manual, G&SR, Instructions issued by Railway Board & RDSO. Latest developments in the field of electric locomotives / EMU operations.

**7. Store Matters:**

Procedure related to procurement of stock items and non-stock items, distribution and accountal of stores. Receipt and custody of stores. Sale of surplus stores. Inventory management, ABC Analysis. Procurement through GeM, IREPS. Schedule of powers under stores matters.

**8. Tenders and Contracts:**

Work proposals, Types of estimates & estimation stages. Type of tenders, earnest money, Performance guarantee, security deposit, technical & financial eligibility criteria, Merits and demerits of EPC tender. IRPMS. Procedure and stages of e-tendering through IREPS, General Condition of Contract (GCC) for works and service contracts, various provisions in Schedule of Power (SOP) under works matters, Basic principles of Project management, quality control in electrical works.

**Syllabus for 30% LDCE for promotion to Group 'B' post of AEE in Electrical Department.**

## A. Professional Subjects :

### Part I : General Electrical Engg.

1. Electrical Circuits: Electrical Circuit Elements (Resistance, Inductance and capacitance), Voltage and Current Sources, Ohm's law, Kirchoff's Voltage and Current Laws, DC & AC circuit analysis, Magnetic circuits and analysis, Poly phase circuit analysis.

2. Electronic Devices & Analog Electronics: Energy Band Theory of Solids, Intrinsic and Extrinsic Semiconductors Doping, Doping Materials, Carrier Mobility, Conductivity, Semiconductor Diodes, Diode Rectifiers, Bipolar Junction Transistor, JFET, MOSFET, Transistor Biasing Circuits. CE, CB and CC modes of transistor. Using transistors as amplifiers and switches. Characteristics of an Operational Amplifier – Applications of Op-Amp as an Inverting and Non-Inverting Amplifier, Integrator, Differentiator, Summing and Subtracting Amplifier and Logarithmic Amplifier. Differential Amplifier - Calculation of common mode rejection ratio, Active & Passive Filters.

3. Digital Electronics: Number Systems, Basic Logic Gates & Boolean Algebra, Digital Logic Gate Characteristics, Minimization Techniques, Combinational Logic Circuits, Flip flops and Sequential Circuits.

4.Power Electronics: Power Semiconductor Devices (Diodes, BJT, MOSFET, SCR, GTO and IGBT) and their characteristics, selection of devices for different power electronics applications, Working of single phase and three phase rectifiers, H-bridge inverter, Three phase voltage source inverter, PWM converters, Harmonic analysis and power factor improvement, AC machine control, VVVF drives.

5. Electrical Engg. Materials: Properties & applications of Electrical insulating materials, Magnetic materials, Conducting materials & Semiconducting materials.

6. Electrical Machines: DC Machines, Induction Machines and Synchronous Machines. Losses in rotating machines. Single phase and three phase transformers. Losses and efficiency of transformers, Machine Drives.

7. Renewable Energy Sources: Climate change, Global warming, Various sources of Renewable energy- Resources and applications, Solar Cells, Rooftop solar and land based solar plants- Concepts of Basic Design, construction and maintenance, Off grid and Grid connected solar plants, Wind turbines, Net Zero carbon emission, ECBC, Round the clock green energy, Energy Storage systems, Policies and regulations , Net and Gross metering, Business model, tendering.

8. Power System and Protection: Basic concepts of electrical power generation and various equipment. Concepts of transmission lines, Models and performance of transmission lines and cables, Series and shunt compensation, Electric field distribution

and insulators, Distribution systems, Per-unit quantities, Bus admittance matrix, Load flow methods, Power factor correction, Symmetrical components, Symmetrical and Asymmetrical fault analysis, Principles of various protection system,
Circuit breakers, Latest research in the field of power system.

**Part II : Railways Electrical Engg**

**1. General Services:**

a. Power Supply arrangement: Radial distribution system, Looped(Ring Main ) distribution systems. Layout & Equipment at Distribution sub-station. Operation & Maintenance of sub-station, Various testing at sub-station, overhead & underground distribution, protective devices & their coordination. Construction, erection & commissioning of new sub-station and distribution lines. Basic features of PVC and XLPE cables. Cable rating and derating, Cable laying. Concept of average demand, peak demand, load factor & electrical billing. Power factor improvement, Electrical & fire safety, Safety auditing of sub-station, concept of energy audit, Functions of Electrical Inspector to Government (EIG) in Railways. Power line crossing, Electricity Act-2003, CEA Regulations, SCADA and Substation automation. Earthing arrangement.

b. Building Electrification: Types of various wiring methods, metering & safety measures. Wire, switchgears & fittings used for wiring, Energy efficient appliances, scale of fittings as per policy in various types of quarters, various types of Tariffs, commercial connection, concept of prepaid and postpaid metering, concept of smart meters. Safety coordination, Electrical accidents and prevention.

c. Illumination & Lighting: Various parameters related to illumination, Different types of illumination sources, lighting methods, classification of lux levels at various types of stations, yard lighting & street lighting. Passenger amenities at Railway stations.

d. Water supply: Types of water supply system, Pumping system, Classification of pumps, Comparison of various pumps, fluid theory, discharge calculations. Centrifugal pump, turbine pump, Submersible pumps, characteristic curve of pumps, efficiency. Cavitations & priming of pumps, necessity of multistage pumping, storage capacity and purification of water. Installation, maintenance & troubleshooting of pumps, Starter & drives of pumps, automation of pumps.

e. Lift & Escalator: Working of Lift & Escalator, Installation of Lift and Escalator. Maintenance, various safety devices, control panels & Safety aspects.

f. Air Conditioning & Refrigeration: Theory of air conditioning, refrigeration cycles, Various types of refrigerants, window/split/package AC unit. Central air conditioning plant, VRF system, air cooling systems, planning for capacity and drives for refrigeration plant, Maintenance and troubleshooting.

g. Energy Conservation: Need of conservation of energy, Various measures being taken by railways to conserve energy in the field of Electrical General Services. Necessity and implementation of Open Access in Indian Railways. Energy conservation Act.

2. **Traction distribution:**

a. OHE: Basic design concepts of TRD system of conventional and 2x25kV system. Types of overhead equipment. Sectioning principles of OHE. Various parts of OHE. Foot Patrolling, current collection, Tower wagons, seasonal & cyclic checks, maintenance Schedule, Preventive maintenance Tools, failure investigation of OHE, earthing and bonding. Railway Electrification and process of construction. Power Blocks & Procedure to obtain it.

b. PSI: Schematics of 1x25kV and 2x25kV traction substation with names/ratings of various equipment, protection scheme for TSS. Fixed and dynamic PF correction, Feeding stations, SSP & SPs, 132 kV transmission lines, PSI equipment. Maintenance and failure investigation of PSI equipment.

c. SCADA and Miscellaneous items: Operation and maintenance of remote control, traction power control organization, permit to work, emergency arrangements, coordination with operating and other departments. Liaison with supply authorities, maintenance and failure investigation of SCADA equipment.

d. NDT techniques, Open Access, safety precautions for electrified sections, Latest development in TRD, MSG meetings. Instructions issued by Railway Board, RDSO's TI/MI, TCs, IRSOD & ACTM.

3. **Train Lighting and AC Coaches:** Systems of Train Lighting and Air conditioning on coaches, Self Generating Coaches, ICF TL/AC Coach Generation system. Circuits and protection in ICF TL/AC coaches, Emergency feed extension in coaches. Air Conditioning in coaches, Heat Load Calculation, Precooling and Pulldown Tests. Dynodrive test. 25 kVA coach inverter, Water raising apparatus. EOG and HOG systems in coaches- Hotel Load converter and Interlocking panel. Power and control circuits and protection systems in LHB TL/AC coaches, Power car, Pantry car, AC Double Decker, AC 3Tier Economy and LSLRD coach. HVAC Microcontroller and Electronic equipment in LHB coaches. LHB pantry car and its equipment. Push pull train operation. Maintenance schedules of ICF and LHB coaches, Pantry cars and Power cars. Manufacturing, POH and IOH activities of coaches. Commissioning tests and Special Repair. Circuits, working and maintenance of Passenger amenities items in ICF/LHB coaches. Coaching depot working, Primary & Secondary maintenance, Sick line attention, Pit occupation chart, Rake links and Coach requirement, Staff yardsticks and benchmarking. Duties of ACCM/ACCA. Pre-cooling of AC Coaches. Features of ICMS. Unit exchange spares. Fire causes and prevention measures in coaches. SMIs, Modification Sheets and Technical circulars issued by RDSO and instructions by Railway Board and RDSO. Reliability Action plan, recent developments in coaches.

4. **Electric Locos:** Organizational structure and duties of officers & staff. Conventional AC & 3 phase locomotives on IR. Equipment in locomotives, their functioning / operations, maintenance / overhauling and testing parameters & maintenance schedules. Reliability & safety action plans. Traction Power Circuit, Auxiliary Circuit, Control Circuits and Pneumatic Circuits. Different types of braking arrangements. Locomotive maintenance schedules & various tests to be carried out. Working of Electric Loco Shed & Electric Loco Workshop. Safety items and safety checks involved in safe locomotive operation. Relevant paras of ACTM, Accident Manual, G&SR, IR SOD and Instructions issued by Railway Board, RDSO and CLW. Latest developments in the field of electric locomotives.

5. **EMU and MEMU/Metros:** Concept of EMU/MEMU/Metro trains, various types of EMU/MEMU stock, Conventional & 3 phase EMUs & their salient features. Different types of brakes used in EMU/MEMU/Metros. Power circuits, auxiliary, control circuits. Mechanical components and its functions. Different electrical equipment and its functions. Inspection/Maintenance/Overhauling schedules of EMUs/MEMU/Metros. Safety precautions and fire prevention in EMU/MEMU/Metros. Train Control Management System(TCMS). Recent developments in EMU/MEMU/Metros.

6. **Electric Loco and EMU Operation:** Organizational structure and duties of officers & staff. Crew management – Training, Monitoring & Counseling. Crew & loco links. HOER Rules. Loco utilization. SPAD (Signal Passing At Danger). Management of Crew lobby, running room, trips shed & TLC / Power controller office. Working of CMS & FOIS. Safe, punctual & efficient loco / EMU operation with online troubleshooting of locomotive / EMU failures. Relevant paras of ACTM, Accident Manual, G&SR and Instructions issued by Railway Board & RDSO. Latest developments in the field of electric locomotives / EMU operations.

7. **Store Matters:** Procedure related to procurement of stock items and non-stock items, distribution and accountal of stores. Receipt and custody of stores. Sale of surplus stores. Inventory management, ABC Analysis. Procurement through GeM, IREPS. Schedule of powers under stores matters.

8. **Tenders and Contracts:** Work proposals, Types of estimates & estimation stages, procedure of survey, Type of tenders, earnest money, Performance guarantee, security deposit, technical & financial eligibility criteria, Merits and demerits of EPC tender. IRPMS. Procedure and stages of e-tendering through IREPS, General Condition of Contract (GCC) for works and service contracts, various provisions in Schedule of Power (SOP) under works matters, Basic principles of Project management, quality control in electrical works.

## 6. SYLLABUS FOR 70% SELECTION & 30% LDCE FOR PROMOTION TO GROUP 'B' POSTS OF AOM & ACM IN THE TRAFFIC (TRANSPORATION AND COMMERCIAL) DEPARTMENTS

### A. TRAFFIC (TRANSPORTATION)

**I. GENERAL** Hierarchical set up and line of control of Operating Department at the Divisional, Zonal and Railway Board level.

### II. TRAFFIC, TRAIN AND POWER CONTROL ORGANIZATION

- Objective and set up of Control Offices.
- Functions of Control Organization pertaining to Train Ordering, Punctuality, *M*aintenance of Operating Statistics, Wagon & Loco Stock Management, Blocks Management and Management during Accident & Unusual Situations/ Circumstances & Disaster Management.
- Duties and responsibilities of Chief Controllers, Dy. Chief Controllers, Sections Controllers, TNCs, Recorders and their Coordination with Lobbies, Station & Yards.
- Freight Train Operations (FTO) & Freight Train Ordering Principles with or without coordination with Crew Lobbies.
- Special Instructions during abnormal conditions of working & during emergencies like Cyclone, Civil Disturbances, and Accidents etc.
- Daily Performances Reporting from Stations/Yards/Sheds to Area Sub-control, Area Sub-control to Divisional Control Office and from Divisional Control Office to Zonal Control Office and from Zonal Control Office to Railway Board.
- Basic and important Documents/Registers maintained in Control Office and their basis.
- Periodical Performance Reporting and Analysis of Operating Performance along with compilation of Statistical Data.
- Power Control Organization - Engine and Crew Scheduling.
- Factors affecting Wagon & Engine utilization and methods of improvements.
- Working pertaining to issue of Caution Orders from Nominated and Notice Stations.
- Liaison / Co-ordination with Control Establishments of other Departments like Engineering, Traction Control, Signaling Control, Mechanical etc.

### III. FREIGHT TRAIN OPERATIONS

- Functioning of Crew & Guard Lobbies.
- Integrated Lobbies.
- Crew Management: Assessment of Crew Requirement
- Running Room and its Management.

- Engine Utilization aspects requiring special attention: -.
    - ❖ Engine Crew and Train Crew Schedule.
    - ❖ Rules regarding Outstation, Home Station Rest etc. to ensure observation of 10 Hour Rule or Rules applicable from time to time, Role of Ll and Crew Control.
    - ❖ Power Plan: Assessment of Loco Requirement.
    - ❖ Movement of Dead Locomotives.
    - ❖ Management of Maintenance Schedule of Locomotives.
    - ❖ Shed and Traffic Outage of Locomotives.
    - ❖ Specific Fuel Consumption and Assessment of Fuel Requirement.
- Shunting Operations in Yards or Road side Stations.
- Working of Marshalling Yards & Transhipment Points.
- Causes of Yard and Section Congestion and remedial strategies.
- All India Marshalling Order and Railway-wise Marshalling Orders - Principles and Procedures.
- Rules regarding Carriage of Explosive and other General Goods.
- Preferential Traffic Schedule, Priority within same class and ODR.
- Indent Allotment and Supply of Freight Stock at Stations, Premium Indents and procedure to place Premium Indents, Allotment of Rakes in case of Quota Restrictions.
- Notified Stations.
- *W*agon Stock Management for Loading and Unloading Operations.
- Imposition of Operating Restrictions on Wagon Loading and Acceptance of Wagon Indents, Cancellation and Withdrawal of Indents.
- Observance of Civil ban and Carriage of Contraband Goods etc,
- Important Documents/Registers maintained in Yards & at Stations.
- Familiarity with G&SR, Accident Manual, Operating Manual, Block Working Manual, Red Tariff, IR Act, 1989 etc.
- Wagon Turn Round Time (WTR) & Factors affecting Optimum Utilization of the Wagon Fleet and methods of improvement.
- Running of Unit Trains and formation of Captive Rakes.
    - ➢ Block Train Operations.
    - ➢ Nominated Day Loading.
    - ➢ Rationalization Scheme of movement of Freight Traffic for avoiding congestion by specific routes.
    - ➢ Merry-Go-Round (MGR) System.
    - ➢ Engine on Load (EOL) System.
    - ➢ Mini/Two Point/Multi Point Rake System.
    - ➢ Container Train Operation, Hub and Spoke system.
- Supervision and control over movement of Special type of Stock, ODC

Consignments.

- Maximum Moving Dimensions. *W*agon Census.
- IT applications: -

  ✓ Freight Operations Information System (FOIS): Rake Management System(RMS), Terminal Management System(TMS)

  ✓ ICMS and Coaching Operations Information System(COIS)

  ✓COA

  ✓CMS

  ✓ SATSANG

  ✓ RTIS

- Relevant Rules and important Policy guidelines.
- C&W examination for STR, Intensive, Round Trips, Premium and Close Circuit Rakes.
- Sicklines and TXR Repair Depots including POH & ROH Depots and their functions.
- Supply of Coaches/Wagons to C&W shops for POH and special repairs, Cycle period of different Stocks and Workshop Feed Management.
- Working of Travelling Traffic Cranes for handling heavy Consignments at Intermediate Stations.
- Detaching of Sick Wagons at enroute Stations and their repair and clearance.
- Interchange transactions - Junction returns of Inter Railway Inter change Traffic.
- Weighment of Rakes, Electronic In-Motion Weighbridge, Automatic Pre Weighbin System, Nominated and Alternative Weighbridges, Load Adjustment, Exempted Commodities, Maintenance of Weighbridges and Role of Weights and Measures Department, Metrological Department and other Railway Departments, Integration of Weighbridge with FOIS.
- MIL RAIL.
- Permissible Axle Loads, Heavy Haul and Long Haul Operations, factors affecting Axle Load, Rules regarding Heavy Haul and Long Haul Operations.
- 'Payload' to 'Tare' Ratio of Wagons; Factors affecting Payload and Tare Weight.
- Concept of Convoy Trains.
- Foreign Traffic and its components/pattern.

**Operating Statistics**

- Definition, meaning and methods of compilation of the Primary, Fundamental and Derived units.

- Engine Tickets and maintenance of Engine Tickets

- Analysis of the Operating Statistics.

- Important Operating Efficiency Indices, their meaning and uses, *W*TR, NTKM, GTKM, A*v*erage Speed etc.

- Operating Ratio: Different types of Expenditures and Plan Heads, Revenue Earnings and Non-Revenue Earnings.

**IV PASSENGER TRAINS OPERATIONS**

- General Principles and Methodology of Time Tabling of Passenger Trains. Zero Based Time Tabling.

- Platform and Pit Occupancy Planning and Preparing Charts.

- Consultative Machinery for revision of Time Table at Divisional, Zonal and Railway Board levels.

- Publication of Working Time Table, Public Time Table & Sheet Time Table, Components of WTT and PTT.

- Punctuality of Passenger Carrying Trains.

- Factors affecting Punctuality of Passenger carrying Trains and methods of improving the Punctuality, Monitoring of Asset Failures and Planning of blocks for Track, Signal and OHE maintenance. Corridor Blocks, Integrated Maintenance Blocks.

- Augmentation of Train Loads for meeting Traffic requirements, Rules of *M*arshalling and Slip Coaches etc.

- Running of Tourists Coaches, Special Carriages and Special Trains.
- Planning & Running of Holiday Specials, Mela Specials, Tourist Specials, etc.
- Introduction of new Trains, extension of Train runs, introduction of Through and Sectional Coaches.
- Preparation of Engine Links, Driver*/G*uards Links & Rake Links.
- Commuter Service Operations.
- Vande Bharat Trains
- High Speed Corridors and Trains.

**V. WORKING OF TRAINS GENERALLY AND GENERAL AND SUBSIDIARY RULES**

- Responsibility and Function of Engine Crew before starting and while on run and during abnormal/unusual situations.

- Responsibility and function of Guard before starting and while on run and during abnormal/unusual situations.
- Role & Responsibility of Station Staff in Working of Trains.
- Various Systems of Working of Trains and Conditions for Granting LC.
- Classification of Stations, Standards of Interlocking, Signaling Systems, Equipment & their working.
- Station Working Rules and Block Working.
- Level Crossings.
- Line Capacity, Method of Calculating Line Capacity, Measures for augmenting it, Token less working, Centralized Traffic Control, Doubling, Automatic Block, IBS / IBH, Advanced Signaling and Interlocking.
- Combined Train Report, Guard's Rough Journal Book, Vehicle Guidance, Driver's Ticket, Brake Power Certificate etc.
- Rules regarding Marshalling of vehicles on Passenger, Mixed and Freight Trains.
- Air Brake Systems along with Continuity Test.
- Precautions to be taken on Ghat Sections.

**VI. ACCIDENTS AND SAFETY ORGANIZATION**

- Accidents, Types and their Classification, Causes and their Prevention.
- Functioning of Railway Safety Organization.
- Chief Commissioner of Railway Safety Organization and his Functions.
- Rules for reporting Accidents.
- Accident Relief Medical Equipment (ARMEs) & Accident Relief Trains (ARTs).
- Role & Responsibilities of various Officials and Departments during Accidents.
- Responsibility of the Control Organization Station Masters and Traffic Staff on the affected Section.
- Accidents Enquiries and DAR action against Staff held responsible for the Accidents, minimum recommended penalties in case of various Accidents.
- Review and Analysis of Accidents for taking Corrective Measures.
- Disaster Management on Indian Railways, Disaster Management Act, 2005, Disaster Management Plan, Role of NDMA and NDRF.

**VII. ACCIDENTS PREVENTION**

- Aptitude Testing of Station Masters, Loco Pilots and Motor Men, Components of Aptitude Testing.

- Psycho-Technical Analysis in case of Accidents attributed to Human Failures.
- SPAD and its Prevention.
- Train Operation during Fog, Fog PASS.
- Improved Technological Aids to prevent Human Errors like:
  - Improved Signaling and Inter-locking arrangement
  - SM's central and inter cabin control over route
  - Track circuit and Axle counters
  - Route Relay Inter-locking
  - Solid State Interlocking/Electronic Interlocking
  - Automatic Train Protection *(*ATP), KAVACH (TCAS - Train Collision Avoidance System)
  - Wheel Impact Load Detector (WILD)
  - End of Train Telemetry (EOTT) and its functions.
  - Centralised Traffic Control (CTC)
  - On Board Monitoring of Rolling Stock (OMRS).
- Refresher Courses, Safety Camps, Safety Campaigns and Safety Drives.
- Planning of PME and Refresher of Safety Category Staff.

**VIII . PLANNING ON THE RAILWAYS**

- Set up & Functions of Planning Wing on IR.
- Corporate Plan and Annual Plan, National Rail Plan, Mission 3000MT, National Logistics Policy.
- Traffic Survey.
- Calculation of Line Capacity.
- Traffic Planning and Augmentation of Line Capacity Works.
- Station Redevelopment.
- Doubling, Bypass & Flyover Planning Works.
- ESP,SIP, DPR, ROR etc
- Container Rail Terminals.
- Gati Shakti Terminals.
- Minimum Essential Facilities at Goods Sheds and Stations.

## B. TRAFFIC (COMMERCIAL)

### I. General

Organization and Functions of Commercial Department at Divisional, Zonal and Railway Board level.

### II. Goods Traffic:

- Booking of Goods Traffic - Forwarding Notes, Registration of Indents, Allotment, Rating and Routing of Traffic, Mis-declaration, RR, Weighment including Punitive Charges due to overloading, Classification of Goods, Loading and Unloading including Transhipment, Free Time for Loading and Unloading, Booking of Animals, Dangerous and Offensive Goods, Military Traffic, RMC, PCC of Wagons, Special Purpose Wagons, Standard Rake Sizes, Terminal Management System (TMS) etc.

- Working of Goods sheds, Different charges like Demurrage, Wharfage, Penal Demurrage, Penal Wharfage, Stacking, Stabling, Terminal Access Charge, Terminal Charge. Through Distance Charging, Round the clock working of Goods Sheds, PPP mode development of Goods Sheds etc.

- Container Traffic, Container Rail Terminals, Booking of Container Traffic, Haulage Charge, Container Class Rates, FAK Rates, Restricted and Open Commodities, Weighment of Container and Exemptions, Double Stack Dwarf Containers, Tank Containers.

- Weighment, Rules of Levying of Punitive Charges for overloading, Electronic In-Motion Weighbridge (EIMWB), Automatic Pre Weighbin System, Integration of Weighbridges with FOIS.

- e-RD and e-TRR, e-Payment / Online Payment, Late Payment of Freight Charges, GS*T*/e-Waybills.

- Freight Incentive Schemes, Trainload Benefit, Quick Transit Service, Loadability of Wagons, Higher Capacity Routes. Various Wagons Investment Schemes like LSFTO, AFTO and GPWIS.

- MGR and Ro-Ro Policies.

- Out Agencies, City Booking Offices and other Ancillary Services.

- Siding, Assisted and Private Siding Rules, Charges, Military Siding, Liberalized Siding Policy, Siding and Shunting Charges, GCT Policy.

- Dedicated Freight Corridor.
- Other recent Policy changes regarding Freight, Lump Sum Rates, Piece Meal Traffic, Freight Forwarder Scheme etc.

- Sealing and Labelling of Wagons, Delay in Transit, Diversion of Wagon Load Traffic, Disposal of Seal Defective *W*agons, Transport of Small Traffic.

- Delivery of Consignment, Undercharges, Overcharges, Refund of Overcharges, Delivery of Consignment Short of Destination, Disposal of Consignments Over Carried, Disposal of Unclaimed and Unconnected Consignments, Open Delivery and Assessment Delivery, Missing Goods Report, Damage and Deficiency Report.

- Dynamic Pricing, LTTC, TEFD, Station to Station Rates (STS) etc.
- Various Private Siding Policy - Green Field PFT, Brown Field PFT etc.
- Preferential Traffic Order (PTO), Rationalization Routes, Diversion and Rebooking of Goods Traffic.
- Coordination of functions of various Consultative Committees at National, Zonal and Divisional Level.
- Liability of Railways as Carriers of Goods and Animals.

**III. Passenger Traffic:**

- The Railways Act chapters relating to Passenger Traffic and Traffic Facilities, Working of Railways, Responsibility of Rail*w*ays as Carriers and Penalties and Offences.

- PRS, Reservation and Refund Rules, Break Journey Rules, ARP *(*Advance Reservation Period), PNR, Concept of e-Tickets, Tatkal Rules, Tickets through ATMs, Premium Trains*/*Dynamic Pricing, Different types of Quotas and its allotment Block Booking, Passenger Profile Management (PPM).
- Unreserved Ticketing System (UTS), UTS on Mobile, Automatic Ticket Vending Machines *(*ATVM), Jansadharan Ticket Booking Scheme (JTBS), Rail Travel Service Agents (RTSA), Station Ticket Booking Agent (STBA), Yatri Ticket Suvidha Kendra (YTSK) etc.
- Suvidha Trains, Special Trains.

- Various measures including Intensive Check Posts (ICPs) to Combat Ticketing Frauds and Ticket less Travelling, Hand Held Terminals (HHT), TTE Lobby System,
- Categorization of Railway Stations depending upon Passenger Earnings and*/*or outward Passengers.
- Passenger Amenities, Model Stations-Minimum Essential Amenities Recommended and Desirable Passenger Amenities depending upon classification of Station, Works Programme etc.
- Policy Guidelines for Halt Stations.

- Integrated on-board Services, Bedroll distribution in AC Coaches, Cleanliness of

Coaches, On Board Housekeeping Services (OBHS), Clean Train Station (CTS), National Green Tribunal (NGT), Station Cleanliness and Role of EnHM Directorate etc.

- Public-Private-Partnership (PPP) Schemes, Pay and Use Toilets (Deluxe as well as Normal), Retiring Rooms, Waiting Halls, Beautification of Stations etc.
- Train Enquiry System - National Train Enquiry System (NTES), Integrated Train Enquiry System (ITES), Call Centers, RTIS etc.
- Integrated Coach Management System(ICMS)
- Customer Care Training- a more customer friendly attitude among the Frontline Staff, On the job training etc.
- Passenger Service Committee, Passenger Amenities Committee.
- *V*ande Bharat Trains.

**IV. Parcel Traffic**

- Parcel Business Scenario.
- Rules regarding Parcel Booking, Marking, Labelling, Overloading etc.
- Delivery of Parcels, Open Delivery and Assessment Delivery.
- Leasing Policy for SLRs and VPUs, Parcel Cargo Express Trains (PCET), Kisan Rail, Rail Milk Tankers.
- Advance Booking of Parcel Space.
- Categorization of Parcel Classes, Procedure to change the Class.
- Rating of Parcel Traffic.
- Parcel Traffic in Container: Policy.
- Disposal of Unconnected/Unclaimed Parcels.
- Handling of Claims cases in case of Parcel Traffic.
- Parcel Management System (PMS).

**V. Other Sources of Revenue:**

- Non-Fare Revenue & its Sources, Importance of NFR, Scope of increase and Impediments in Increasing NFR.
- Sundry Earnings.
- Commercial Publicity-Policies and implementation on Zonal Railway*s*.
- Classification of Earnings, Earning Estimates.
- Strategies to enhance Sundry Earnings, Parking Contracts, Lounges, Cyber Cafes, ATMs, various Kiosks etc.
- Catering and Vending Services, Catering Policy, Book Stalls Policy, Multi Purpose Stall (MPS) Policy, One Station One Product (OSOP) Policy. BDU.

**VI. Traffic Accounts:**

- Station Balance Sheet, Accountal of Earnings, Collection of Earnings and Rail

Shakti Scheme.

- Online Balance Sheet.
- Commercial Inspections, Schedule of Inspections, Important factors to be observed during Commercial Inspection.
- TIA Inspections
- Station Outstandings, Realization and their Clearance, Certified Over Charged Sheet.
- Audit and its replies.
- Disposal of old Records including Tickets.
- Frauds and Embezzlements and their Prevention

**VII. Misc:**

- IRCTC and its functions, FTR Trains booking.
- Commercial Statistics-their usefulness.
- Postal Traffic.
- Traffic Surve*y.*
- Land Management Policy of IR. Claims Organization:
- Claims and Claims Preventions, Claims Statistics.
- Railway Claims Tribunal Act, RCT Organization and its functions.
- **Compensation in case o**f Untoward Incidents and Accidents, Ex-gratia payments.
- Railway Tourism, Circular Tickets, Bharat Gaurav Trains.
- Marketing and Sales activities at the level of Divisions and Headquarters.
- Liability of Railways in case of Accident of a Passenger Carrying Train.
- Customer Care, Courtesy and Public relations.
- Public Grievance Redressal, Rail Madad, CPGRAM etc.
- IT Applications – Freight Business Development Portal (FBDP)/ Rail Sugam Mobile App, Parcel Business Development Portal, ICMS, e-Auction, NTES, IRPSM, IREPS, PRIMES, UDM (User Depot *M*odule), GeM, RBS (Rates Branch System), e-ACT & TPMS (Terminal Pipeline Management System) in FOIS.
- National Rail Plan, Mission 3000MT.
- National Logistics Policy.

# SYLLABUS FOR 70% SELECTION FOR PROMOTION TO GR.B POST OF AEN IN CIVIL ENGINEERING DEPARTMENT.

## (A) Civil Engineering (General)

### 1. Surveying

#### a. Types

**i. Surveying basics**

Basic principles; base lines; check lines: perpendicular and oblique offsets; conventional signs; plotting of survey; true and magnetic bearings; open and closed traverses; recording plotting of traverse, closing errors.

**ii. Surveying equipment**

Auto level, Total station, DGPS, LIDAR.

**iii. Leveling -**

Level Lines - datum, bench marks, simple leveling, fly leveling; recording the levels in field book; method of reducing levels; arithmetical check; longitudinal and cross section contouring.

**iv. Theodolite Survey -**

Types of theodolites; measurement of horizontal angles, vertical angles, magnetic bearings and deflection angles; prolonging a straight line; traversing by method of included angles; balancing the survey - closing errors; calculations of latitude and departure.

#### b. Curves-

Elements of simple circular curves, setting out simple circular curves.

#### c. Set out works -

Setting out buildings, culverts, Central line of Railway alignment. Usage of GPS technology in setting out Centre line of Railway alignments.

### 2. Strength of Materials, Structural Designs & Drawings

#### a) Strength of Materials:

Stress, strain, Hooke's law, working stress, factor of safety; bending moment and shear force in simply supported beams and cantilevers; simple theory of bending.

#### b) Structural Design & Drawing Drawings

Different sizes of paper, folding and storage of drawing, plan, elevation, sections, isometric view.

#### c) RCC Structures

RCC, methods of design, Working Stress Method and Limit State Method. IRS Code

of Practice for RCC (Concrete Bridge Code).

**d) Steel Structures**

Rivets and welds. Sketch and detailing of connections different types of joints and strength determination. IRS Steel Bridge Code.

**3. Construction material:**

Description, specification, properties and uses of building materials - stones, sand, timber, bricks, cement, lime, building hardware, paints varnishes, glasses, and tiles. Concrete mix design, placing, compaction and durability.

**4. Foundation & Construction Engineering**

**a) Soil Mechanics**

Different type of Soils, Three phase diagram and their relationships, IS classification of soil, index and engineering properties of soil, compaction, consolidation, shear strength, earth pressure theories, slope stability. Specification and construction of earthwork in embankment and cuttings.

**b) Foundation Engineering**

Functions of foundation, different type of foundations - open foundations; well foundations and pile foundations, determination of safe bearing capacity, stress and settlement analysis, method of reducing differential settlements.

**(B) Civil Engineering (Railways)**

**1. Railway Surveys & Construction**

Provisions in Engineering Code regarding - Classification of Surveys, Terms of Reference, Principles governing Railway alignment, Ruling gradients, Grade compensation for curves, Horizontal and vertical curves, Hill Surveys, Catch sidings, Tunnels, preparation of various maps and drawings, preparation of Survey reports for RECT, PECT and FLS, Project estimates.

**2. Railway Track.**

**(a) Track Structure and Components.**

Classification of Lines, Track Structure, Rail and Rail fastenings, Sleepers & Fastenings, Ballast- Specifications, Ballast Profile/Section/Depth of Cushion, Formation- Classification of Formation Requiring Treatment and Remedial Measures Suggested, Insulated joints & Switch expansion joints, Track structure on Bridges.

**(b) Duties.**

Duties of ADEN, Duties of SSE/P.Way (In-charge), Duties of JE/ SSE/ P.Way (sectional), Duties of JE/ SSE/ P.Way (Other than sectional), Duties of Gang mates, Keymen, Patrolmen, Gateman and Track maintainer.

**(c) Maintenance of Permanent way.**

Regular track maintenance, Handling and maintenance of rails, sleepers, fastenings & other misc. Items, Works incidental to regular track maintenance, Record keeping, Maintenance of track in track circuited areas, Maintenance of track in electrified

areas.

**(d) Special Maintenance Works.**

Alumino Thermit welding of rails, Flash-Butt welding of rails, Short welded Rails, Long welded Rails. USFD.

**(e) Curves and Turnout.**

Curves, Realignment of curves, Points and Crossing.

**(f) Track tolerances and Track Monitoring.**

**(g) Schedule of dimensions.**

Schedule-I Standard dimensions, Station Yards and extra clearance on curve.

**(h) CRS sanction for works affecting passenger running lines.**

**(i) Training and Competency of Permanent Way Staff.**

**(j) Permanent Way renewals.**

**(k) Engineering Restrictions and Indicators.**

**(l) Level Crossings and Gateman.**

**(m) Working of Trollies, Lorries and Material trains etc.**

**(n) Track Management System.**

**(o) General:**

Reference to G & SR; types of signals and their significance; rules for working of trains; block working rules - types, Introduction of temporary single line working.

**(p) Accidents:**

Action during accidents including breaches, Restoration of through running, Pre-monsoon precautionary measures.

**3. Maintenance of Bridges**

**a) Maintenance of bridges:**

Responsibility of the Engineering officials, action to be taken after inspection of bridges; maintenance of substructure - abutments, piers, wing walls and return walls, maintenance of arches, dismantling of arches. Details of common repair techniques - cement pressure grouting, epoxy grouting, shotcreting / Guniting. Maintenance of RCC & PSC super structures - periodical maintenance, common defects and repair / strengthening techniques; maintenance of super structure (steel) girders - loss of camber in steel girders, cracks in steel works, strengthening of weak girders, replacement of loose rivets; maintenance of HSFG bolts, corrosion and its prevention, protective coatings by painting - periodicity and precautions, patch

painting, ordinary paints - for severe and no severe corrosion, metallising & epoxy based paints, Maintenance of welded girders; maintenance of composite girders. Various defects in bed blocks and their remedies; maintenance of bearings; Precautions while carrying out maintenance works on bridges.

**b) Inspection of bridges:**

Classification of bridges - major, minor, important; Inspection of Bridges by Permanent Way and Works Inspectors, by Bridge Inspectors (SSE/JE- P. Way, Works, Bridges) – Periodicity/ schedule and details of inspection, record of bridge Inspection, registers to be maintained by the Bridge Inspectors, Certificate of inspection. Inspection by Assistant Divisional Engineers - Bridge Inspection Register, Numerical Rating System (NRS), Unique Rating Number, Condition Rating Number, Overall Rating Number, Certificate by the Assistant Engineer. Details of Inspection of Bridge –foundations, Flooring, masonry in substructure, under-water substructure inspection, arch bridges, protection works and water ways, girder alignment and seating, structural condition of girders, track on the bridge and its approaches, trolley and safety refuges, foot paths, painting, marking HFL and danger level, providing foundation particulars and bridge name boards, flood records at important bridges, road over/under bridges, concrete bridges, special Inspection during Monsoon, equipment required for inspection of bridges. painting of steelworks, laying of bridge sleepers; replacing cracked bed blocks.

**4. Rehabilitation of Bridges**

Reasons for Rehabilitation, special Strengthening, Imposition of speed restriction, Priority for rehabilitation of bridges, Special Inspection, Site Data, Execution of rehabilitation works, Precautions when working on bridges; rebuilding or alterations to bridges - design and execution of bridge works; temporary arrangements; false work for erection of girders; assembly and erection of girders; cranes for erection of girders; testing of girders; proposal for strengthening existing girder spans: methods of regirdering major bridges, Strengthening of foundations, Strengthening/rebuilding of substructure, shaken/displaced/ cracked bed blocks, distressed arch bridges, replacement of nonstandard girders, replacement of pipe culverts, distress in parapets, replacement of small opening, distress in superstructure.

**5. Rivers & Floods**

Behavior of rivers; past history of bridges, danger level at bridges, watchman at important bridges, duties and equipment of bridge watchmen; special inspection during monsoon, action to be taken in the case of weather warning, pitching stone, boulder and monsoon reserve; vigilance during floods; flood records during and after the monsoon; survey of the course of river. Rivers and flood register, Flood Reports, rainfall data, provision of anemometer on bridges. River training works, Guide Bunds, Spurs (Groynes), Marginal Bunds, Closure Bunds, Assisted Cut-Offs, Boulder crates, Protection of approach banks, drop wall & curtain wall i.e. protection measures for minor bridges.

**6. Inspection and Maintenance of Tunnels and Deep Cuttings:**

**a) Tunnels -** Inspection by Engineering officials, items to be covered in the

Inspection, record of inspection, mobile staging for inspection, details of tunnel inspection, ventilation of tunnels, leakage in tunnels and methods of correction, works connected with the maintenance of tunnels.

**b) Deep Cuttings** - General, inspection register of vulnerable cuttings, points to be noted during Inspection of cuttings, action to be taken in the case of boulder drops,action to be taken after inspection of cutting, guarding of vulnerable cuttings.

**7. Inspection and Maintenance of Building and Structures (Other than Bridges)**

a) Inspection & Maintenance of buildings & structures (including steel structures).
b) Building Registers
c) Periodical maintenance of Works including repairs to leaky roof/water proofing of roofs.
d) Standard Measurement Registers for Buildings·
e) Dismantling of buildings/structures.
f) Retro-fitting / structural repairs of existing weak buildings/structures.

**8. Maintenance of sanitary and hygienic conditions in station and railway Colonies; water supply, drainage and sewerage**

**a) <u>Water Supply</u>**

I. Standards of Quality of drinking water- physical; chemical and bacteriological standards of water, Water-borne diseases, water demand-methods of forecasting, sources of water; Method of treatment of water – aeration; sedimentation; filtration (slow and rapid sand filters); disinfection; hardness methods of removal etc.

II. Conveyance and Distribution:-
Preparation of Schemes for New Water Supply/ Augmentation of Existing Water Supply; Estimating Requirements of Water, water supply from outside sources, Types; Selection & Installation of Pumps; Capacity of Pumping, Conveyance of Water Rising mains; systems of distribution, residual pressure; different types of pipes and fittings; testing of pipes, Pipe laying and Fittings of Valves and Meters, Storage tanks; Capacity, Maintenance and Cleaning of Storage Tanks, Water-Supply Plans, maintenance and operation of water supply installation - responsibilities of Engineering department, Mechanical department and Electrical Department.

III. Rain water harvesting – legislation, necessity; advantage; types; techniques; estimation of capacity of rain water harvesting pits/ salient methods of recharging subsurface aquifer etc.

IV. Water Audit and water Management:
Conservation of Water, water reuse, water recycling, water recycling plant, flow measurement system, identification of losses & leakages.

**b) Sewerage:**

Preparation of schemes for sewerage, sewage & water collection and carriage; design of sewers; house connection; storm water drains; maintenance of sewerage and drainage, conservancy and sanitary arrangements, disposal of sewage – river pollution and control; sewage treatment; land irrigation, septic tanks, primary clarifier, sludge and scum removal, trickling filters, activated sludge process, sludge digesting, principles of anaerobic digestion, sludge gas, sludge drying and disposal.

**c) Sanitation:**

Formation of sanitation committee ; Inspection by sanitation committee , sanitary arrangements in stations and colonies, drinking water wells-protection; Cleaning of wells; disinfection; prevention of Infectious diseases; disinfection of quarters.

**9. Acquisition, management and disposal of land: General Codes, Manuals, rules:**

Ownership of Railway land; sanctioning authority for acquisition and relinquishment; Principles of acquisition and relinquishment; Procedure for acquisition and relinquishment; Land plans and schedule; Documents of Handing over and taking over Railway Land; Land Records- Responsibility and procedure for demarcation, verification of railway boundary , land plan etc. maintenance of right of way; religious structure. Management of railway Land leasing, licensing of land, way leave facility and easement rights, grow more food. Leasing licensing for merchants and vendors at stations, bulk oil installation. Encroachment and responsibly; rules for permission for construction of building near Railway land; instructions regarding cutting/ trimming and sale of natural product like mature tree, dry trees within and outside railway boundary, near electric or telegraph lines , sale of grass right etc. Provisions of Land Acquisition Act. 1989, Right to fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013.

**10. Preparation of Plans and Estimates:**

**(a) Preparation of plans:**

General procedure; plan for other departments; size of drawings; titles and numbering of drawings; scale of drawings; details on drawings; symbols and colours in drawings; RDSO drawings; CE's plans; Plans of Divisional/Asst. Engineer's/inspector's Offices; completion drawings;

**(b) Preparations of estimates:**

Engineering code provisions, various types of estimates, technical details, rates and quantities; schedule of rates and price - listing of stores; report and justification; rent statement for staff quarters; special features of estimates for remodeling of station yards, track renewal works, deposit works: Urgency Certificate;

**11. Contract and Execution of Work:**

**a) Contract:**

Engineering code provisions, schedule of rates; analysis, non-schedules rates, tenders; types; tender documents, drawings and specifications, tender committees, acceptance of tenders, contracts; types, contract documents, General and special condition of contract; measurement and measurement books - code reference; recording measurements; 'on account' and final measurements; standard measurements books ; responsibilities of inspectors/JE/SSE) and Asst. Engineers for measurement of works; ballast measurement; computation quantities; preparation of abstract in measurement books; submission of bills; checking of bills; bill registers; Variations; PVC; Basics of Arbitration.

**b) Execution of Work**:

Engineering code provisions, agencies for executing works; responsibilities of executive officers; deposit works; excess and savings on estimates; attention to public interests; prevention of accidents; planning - activity, milestone, bar charts, critical path networks, PERT; departmental execution of work - record; progress reports, charges for stores and labour, execution of works in Engineering workshops; contracted works; issue of work orders; completion documents; zonal works.

**12. Track Machines:**

**a) Organizational structure, duties and inspection:**

Duties of Executive (XEN)/Assistant Executive Engineer (AXEN)/TM/Line, Duties of SSE/TM/SDI, Duties of SSE/JE/TM Working on Machines, Duties of SSE/JE Machine In-Charge Duties of Machine Assistant, Duties of Assistant Divisional Engineer (Open Line) ADEN, Duties of SSE/JE (P.Way) Deployed with the Machine, Inspection Schedule of Track Machine Officials, Inspection Schedule of Open Line Officials.

**b) Tamping machine and dynamic track stabilizer:**

Types of Tamping Machines, Tamping Mechanism, Tamping Parameters, ALC, Lining System, 4 Point Lining Method, Corrections to be Applied in 4 Point Lining Method, Modes of Tamping using 4-Point Lining Method (Only for curves), 3 Point Lining Method, Corrections to be applied in 3- Point Lining, Determination of Target Versine Values for the 3-Point Lining Method, Mode of Tamping using 3-Point Lining Method, Comparison between 3 Point and 4 Point Lining System, Levelling of Track, Mode of working for levelling, General Lift, Input of the Lifting Values, Survey and working of Tamping Machines in Design Mode, Works required Before, During and After Tamping, Working Principle of Dynamic Track Stabilizer, Modes of working of Dynamic Track Stabilizer, Working of DTS.

**c) Ballast cleaning and handling machines:**

Ballast Cleaning Machines (BCM), Types of Ballast Cleaning Machines, Working Principle and Capability of Ballast Cleaning Machines, Works Required Before, During and After Deployment of Ballast Cleaning Machines.

**d) Track relaying machines:**

Track Relaying Machines, Working Mechanism and Capability of Track Laying Equipment, Pre-Relaying Operations, Operation During Block, Post Relaying Operations, Working Mechanism of TRT, Operations Prior to Deployment of TRT, Operations During The Block of TRT, Post Block Operations for TRT, Precautions During TRT Working

**e) Rail Grinding Machines:**

Rail Grinding Machine (RGM) (Purpose & Advantage), Grinding Strategy, Working Parameters of RGM, Monitoring Equipment for Grind Quality, Quality Inspection of Grinding, Preparatory Works for Introduction of RGM, Pre-Block Activity Before Deploying RGM, Operation During RGM Block, Post Grinding Operation.

**f) Planning and deployment of Machines:**

Pre-requisites for Deployment of Track Machines on Construction Projects/Other Agencies, Minimum Duration of Blocks, Through Tamping and Spot Attention.

**g) Rules for movement and block working**:

Provision of G&SR, Operation and Working of Track Machine, Competencies of Track Machine Staff, Safety Equipment, Rules for Operation – General, Important Instructions and Precautions (Protection of Work Site, Fouling of Adjacent Lines, Information to Level Crossings etc), Failure and Accidents of Track Machines, Speed Certification for Track Machines, Special Precautions while working in Special Circumstances (Ghat Sections, Night Working)

**h) Periodical maintenance and associated infrastructural facility:**

Maintenance Schedule for Various Track Machine, Types of Workshops, Functions of Central Periodic Overhauling Workshop (CPOH), Functions of Zonal Machine Depot (ZMD), Functions of Satellite Depot, Functions of Mobile Workshop, Functions of Camping Coach Workshop.

**i) Track Machine Manpower**

Training (Officers, SSEs/JEs/TM(s), Technical Staff, Machine Assistant), Roster

**13. Miscellaneous:**

**a) Engineering plant:**

Control of plant and machinery, engineering plant reserve, plant register; valuation of plant; maintenance; storage and repairs; requisitioning of plants; use of plant at site; maintenance of log books; hiring out of engineering plant; examination of boilers of the engineering department.

**b) Explosives:**

Issue of Instructions on use of explosives; observance of rules, carriage of explosives, Protection of trains and Railway property, precautions to be observed

during blasting, Misfire with electrical method of firing, explosives disposal, destruction of explosives

**c) Management of Engineering Stores:**

Reference to code and Rules; procurement of stores; requisition; receipt and issue of challans; claims of short receipts; etc.; custody of stores - classification, handling and storage, Account head of stores - operation, records and returns; disposal of released and surplus stores - return to stores Depot, disposal by auction; verification of stock and adjustment for shortage/excesses.

**d) Law and Order**

Railway Police; lodging complaints; cooperation with railway police; cognizable offences; non cognizable offences; powers of arrest by railway staff; warrant against railway staff; action by railway staff in case of attempted sabotage; answering of court summons; Prevention of trespass disposal of human bodies found run over; disposal of cattle found dead on the line.

# SYLLABUS FOR 30% LDCE FOR PROMOTION TO GR.B POST OF AEN IN CIVIL ENGINEERING DEPARTMENT

## (A) Civil Engineering (General)

### 1. Surveying

#### a. Types

#### i. Surveying basics

Basic principles; base lines; check lines: perpendicular and oblique offsets; conventional signs; plotting of survey; true and magnetic bearings; open and closed traverses; recording plotting of traverse, closing errors.

#### ii. Surveying equipment

Auto level, Total station, DGPS, LIDAR.

#### iii. Leveling –

Level Lines - datum, bench marks, simple leveling, fly leveling; recording the levels in field book; method of reducing levels; arithmetical check; longitudinal and cross section contouring.

#### iv. Theodolite Survey –

Types of theodolites; measurement of horizontal angles, vertical angles, magnetic bearings and deflection angles; prolonging a straight line; traversing by method of included angles; balancing the survey - closing errors; calculations of latitude and departure.

#### b. Curves-

Elements of simple circular curves, setting out simple circular curves.

#### c. Set out works -

Setting out buildings, culverts, Central line of Railway alignment. Usage of GPS technology in setting out Centre line of Railway alignments.

### 2. Strength of Materials, Structural Designs & Drawings

#### a) Strength of Materials:

Stress, strain, Hooke's law, working stress, factor of safety; bending moment and shear force in simply supported beams and cantilevers; simple theory of bending. Moving loads on simply supported beams; influence lines for bending moment and shear force in statically determinate beams; short columns, long columns - empirical formulae.

#### b) Structural Design & Drawing Drawings

Different sizes of paper, folding and storage of drawing, plan, elevation, sections, isometric view.

**c) RCC Structures**

RCC, methods of design, Working Stress Method and Limit State Method. Design of singly and doubly reinforced rectangular beams including T and L beams. Design of slabs, design of column, IRS Code of Practice for RCC (Concrete Bridge Code).

d) **Steel Structures**

Rivets and welds. Sketch and detailing of connections different types of joints and strength determination. Design of tension member and compression member. Plate Girders, IRS Steel Bridge Code.

**3. Construction material:**

Description, specification, properties and uses of building materials - stones, sand, timber, bricks, cement, lime, building hardware, paints varnishes, glasses, and tiles. Concrete mix design, placing, compaction and durability.

**4. Foundation & Construction Engineering**

**a) Soil Mechanics**

Different type of Soils, Three phase diagram and their relationships, IS classification of soil, index and engineering properties of soil, compaction, consolidation, shear strength, earth pressure theories, slope stability. Specification and construction of earthwork in embankment and cuttings.

**b) Foundation Engineering**

Functions of foundation, different type of foundations - open foundations; well foundations and pile foundations, determination of safe bearing capacity, stress and settlement analysis, method of reducing differential settlements.

**5. Hydrology and Hydraulics:**

**a) Hydraulics**

Elements of hydraulics - Open Channel flow; flow in pipes, frictional loss, empirical formulae.

**b) Hydrology**

Rainfall and run-off; rainfall statistics; rain gauges, run--off calculations by empirical methods, flood discharge estimation; measurement of flood discharge-current meter.

**c) Hydraulic structures**

Design of bridges - alignment, number of spans; economic spans; waterway calculations; scour depth, afflux; clearance; depth of foundations; BOX and Pipe Culverts, estimation of design discharge based on para 4.3.4 of sub structure code namely using RDSO report RBF-16 for catchment size less than 25 sqkm and using flood estimation report (Synthetic unit hydrograph concept) for catchment size .25 sqkm, to 2500 sqkm.

**B) Civil Engineering (Railways)**

**1. Railway Surveys & Construction**

Provisions in Engineering Code regarding - Classification of Surveys, Terms of Reference, Principles governing Railway alignment, Ruling gradients, Grade compensation for curves, Horizontal and vertical curves, Hill Surveys, Catch sidings, Tunnels, preparation of various maps and drawings, preparation of Survey reports for RECT, PECT and FLS, Project estimates.

**2. Railway Track.**

**(a) Track Structure and Components.**

Classification of Lines, Track Structure, Rail and Rail fastenings, Sleepers & Fastenings, Ballast- Specifications, Ballast Profile/Section/Depth of Cushion, Formation- Classification of Formation Requiring Treatment and Remedial Measures Suggested, Insulated joints & Switch expansion joints, Track structure on Bridges.

**(b) Duties.**

Duties of ADEN, Duties of SSE/P.Way (In-charge), Duties of JE/ SSE/ P.Way (sectional), Duties of JE/ SSE/ P.Way (Other than sectional), Duties of Gang mates, Keymen, Patrolmen, Gateman and Track maintainer.

**(c) Maintenance of Permanent way.**

Regular track maintenance, Handling and maintenance of rails, sleepers, fastenings & other misc. Items, Works incidental to regular track maintenance, Record keeping, Maintenance of track in track circuited areas, Maintenance of track in electrified areas

**(d) Special Maintenance Works.**

Alumino Thermit welding of rails, Flash-Butt welding of rails, Short welded Rails, Long welded Rails. USFD.

**(e) Curves and Turnout.**

Curves, Realignment of curves, Points and Crossing.

**(f) Track tolerances and Track Monitoring.**

**(g) Schedule of dimensions.**

Schedule-I Standard dimensions, Station Yards and extra clearance on curve.

**(h) CRS sanction for works affecting passenger running lines.**

**(i) Training and Competency of Permanent Way Staff.**

**(j) Permanent Way renewals.**

**(k) Engineering Restrictions and Indicators.**

**(l) Level Crossings and Gateman.**

**(m) Working of Trollies, Lorries and Material trains etc.**

**(n) Track Management System.**

**(o) General:**

Reference to G & SR; types of signals and their significance; rules for working of trains; block working rules - types, Introduction of temporary single line working.

**(p) Accidents:**
Action during accidents including breaches, Restoration of through running, Pre-monsoon precautionary measures.

**3. Maintenance of Bridges**

**a) Maintenance of bridges:** Responsibility of the Engineering officials, action to be taken after inspection of bridges; maintenance of substructure - abutments, piers, wing walls and return walls, maintenance of arches, dismantling of arches. Details of common repair techniques - cement pressure grouting, epoxy grouting, shotcreting/ Guniting. Maintenance of RCC & PSC super structures - periodical maintenance, common defects and repair / strengthening techniques; maintenance of super structure (steel) girders - loss of camber in steel girders, cracks in steel works, strengthening of weak girders, replacement of loose rivets; maintenance of HSFG bolts, corrosion and its prevention, protective coatings by painting - periodicity and precautions, patch painting, ordinary paints - for severe and no severe corrosion, metallising & epoxy based paints, Maintenance of welded girders; maintenance of composite girders. Various defects in bed blocks and their remedies; maintenance of bearings; Precautions while carrying out maintenance works on bridges.

**b) Inspection of bridges:** Classification of bridges - major, minor, important; Inspection of Bridges by Permanent Way and Works Inspectors, by Bridge Inspectors (SSE/JE- P. Way, Works, Bridges) – Periodicity/ schedule and details of inspection, record of bridge Inspection, registers to be maintained by the Bridge Inspectors, Certificate of inspection. Inspection by Assistant Divisional Engineers - Bridge Inspection Register, Numerical Rating System (NRS), Unique Rating Number, Condition Rating Number, Overall Rating Number, Certificate by the Assistant Engineer. Details of Inspection of Bridge –foundations, Flooring, masonry in substructure, under-water substructure inspection, arch bridges, protection works and water ways, girder alignment and seating, structural condition of girders, track on the bridge and its approaches, trolley and safety refuges, foot paths, painting, marking HFL and danger level, providing foundation particulars and bridge name boards, flood records at important bridges, road over/under bridges, concrete bridges, special Inspection during Monsoon, equipment required for inspection of bridges. painting of steelworks, laying of bridge sleepers; replacing cracked bed blocks.

**4. Rehabilitation of Bridges**

Reasons for Rehabilitation, special Strengthening, Imposition of speed restriction, Priority for rehabilitation of bridges, Special Inspection, Site Data, Execution of rehabilitation works, Precautions when working on bridges; rebuilding or alterations to bridges - design and execution of bridge works; temporary arrangements; false work for erection of girders; assembly and erection of girders; cranes for erection of girders; testing of girders; proposal for strengthening existing girder spans: methods

of regirdering major bridges, Strengthening of foundations, Strengthening/rebuilding of substructure, shaken/displaced/ cracked bed blocks, distressed arch bridges, replacement of nonstandard girders, replacement of pipe culverts, distress in parapets, replacement of small opening, distress in superstructure.

**5. Rivers & Floods**

Behavior of rivers; past history of bridges, danger level at bridges, watchman at important bridges, duties and equipment of bridge watchmen; special inspection during monsoon, action to be taken in the case of weather warning, pitching stone, boulder and monsoon reserve; vigilance during floods; flood records during and after the monsoon; survey of the course of river. Rivers and flood register, Flood Reports, rainfall data, provision of anemometer on bridges. River training works, Guide Bunds, Spurs (Groynes), Marginal Bunds, Closure Bunds, Assisted Cut-Offs, Boulder crates, Protection of approach banks, drop wall & curtain wall i.e. protection measures for minor bridges.

**6. Inspection and Maintenance of Tunnels and Deep Cuttings:**

**a) Tunnels -** Inspection by Engineering officials, items to be covered in the Inspection, record of inspection, mobile staging for inspection, details of tunnel inspection, ventilation of tunnels, leakage in tunnels and methods of correction, works connected with the maintenance of tunnels.

**b) Deep Cuttings** - General, inspection register of vulnerable cuttings, points to be noted during Inspection of cuttings, action to be taken in the case of boulder drops,action to be taken after inspection of cutting, guarding of vulnerable cuttings.

**7. Inspection and Maintenance of Building and Structures (Other than Bridges)**

a) Inspection & Maintenance of buildings & structures (including steel structures).
b) Building Registers
c) Periodical maintenance of Works including repairs to leaky roof/water proofing of roofs.
d) Standard Measurement Registers for Buildings·
e) Dismantling of buildings/structures.
f) Retro-fitting / structural repairs of existing weak buildings/structures.

**8. Maintenance of sanitary and hygienic conditions in station and railway Colonies; water supply, drainage and sewerage**

**a) <u>Water Supply</u>**

I. Standards of Quality of drinking water- physical; chemical and bacteriological standards of water, Water-borne diseases, water demand-methods of forecasting, sources of water; Method of treatment of water – aeration; sedimentation; filtration (slow and rapid sand filters); disinfection; hardness methods of removal etc.

II. Conveyance and Distribution:-

Preparation of Schemes for New Water Supply/ Augmentation of Existing Water Supply; Estimating Requirements of Water, water supply from outside sources, Types; Selection & Installation of Pumps; Capacity of Pumping, Conveyance of Water Rising mains; systems of distribution, residual pressure; different types of pipes and fittings; testing of pipes, Pipe laying and Fittings of Valves and Meters, Storage tanks; Capacity, Maintenance and Cleaning of Storage Tanks, Water-Supply Plans, maintenance and operation of water supply installation - responsibilities of Engineering department, Mechanical department and Electrical Department.

III. Rain water harvesting – legislation, necessity; advantage; types; techniques; estimation of capacity of rain water harvesting pits/ salient methods of recharging subsurface aquifer etc.

IV. Water Audit and water Management :
Conservation of Water, water reuse, water recycling, water recycling plant, flow measurement system, identification of losses & leakages.

**b) <u>Sewerage:</u>**

Preparation of schemes for sewerage, sewage & water collection and carriage; design of sewers; house connection; storm water drains; maintenance of sewerage and drainage, conservancy and sanitary arrangements, disposal of sewage – river pollution and control; sewage treatment; land irrigation, septic tanks, primary clarifier, sludge and scum removal, trickling filters, activated sludge process, sludge digesting, principles of anaerobic digestion, sludge gas, sludge drying and disposal.

**c) <u>Sanitation:</u>**

Formation of sanitation committee ; Inspection by sanitation committee, sanitary arrangements in stations and colonies, drinking water wells-protection; Cleaning of wells; disinfection; prevention of Infectious diseases; disinfection of quarters.

**9. Acquisition, management and disposal of land: General Codes, Manuals, rules:**

Ownership of Railway land; sanctioning authority for acquisition and relinquishment; Principles of acquisition and relinquishment; Procedure for acquisition and relinquishment; Land plans and schedule; Documents of Handing over and taking over Railway Land; Land Records- Responsibility and procedure for demarcation, verification of railway boundary , land plan etc. Maintenance of right of way; religious structure. Management of railway Land leasing, licensing of land, way leave facility and easement rights, grow more food. Leasing licensing for merchants and vendors at stations, bulk oil installation. Encroachment and responsibly; rules for permission for construction of building near Railway land; instructions regarding cutting/ trimming and sale of natural product like mature tree, dry trees within and outside railway boundary, near electric or telegraph lines , sale of grass right etc. Provisions of Land Acquisition Act. 1989, Right to fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.

**10. Preparation of Plans and Estimates:**

**(a) Preparation of plans:**

General procedure; plan for other departments; size of drawings; titles and numbering of drawings; scale of drawings; details on drawings; symbols and colours in drawings; RDSO drawings; CE's plans; Plans of Divisional/ Asst. Engineer's/inspector's Offices; completion drawings;

**(b) Preparations of estimates:**

Engineering code provisions, various types of estimates, technical details, rates and quantities; schedule of rates and price - listing of stores; report and justification; rent statement for staff quarters; special features of estimates for remodeling of station yards, track renewal works, deposit works: Urgency Certificate;

**11. Contract and Execution of Work:**

**a) Contract:**

Engineering code provisions, schedule of rates; analysis, non-schedules rates, tenders; types; tender documents, drawings and specifications, tender committees, acceptance of tenders, contracts; types, contract documents, General and special condition of contract; measurement and measurement books - code reference; recording measurements; 'on account' and final measurements; standard measurements books ; responsibilities of inspectors/JE/SSE) and Asst. Engineers for measurement of works; ballast measurement; computation quantities; preparation of abstract in measurement books; submission of bills; checking of bills; bill registers; Variations; PVC; Basics of Arbitration.

**b) Execution of Work**:

Engineering code provisions, agencies for executing works; responsibilities of executive officers; deposit works; excess and savings on estimates; attention to public interests; prevention of accidents; planning - activity, milestone, bar charts, critical path networks, PERT; departmental execution of work - record; progress reports, charges for stores and labour, execution of works In

Engineering workshops; contracted works; issue of work orders; completion documents; zonal works.

**12. Track Machines:**

**a) Organizational structure, duties and inspection:**

Duties of Executive (XEN)/Assistant Executive Engineer (AXEN)/TM/Line, Duties of SSE/TM/SDI, Duties of SSE/JE/TM Working on Machines, Duties of SSE/JE Machine In-Charge Duties of Machine Assistant, Duties of Assistant Divisional Engineer (Open Line) ADEN, Duties of SSE/JE (P.Way) Deployed with the Machine, Inspection Schedule of Track Machine Officials, Inspection Schedule of Open Line Officials

**b) Tamping machine and dynamic track stabilizer:**

Types of Tamping Machines, Tamping Mechanism, Tamping Parameters, ALC,

Lining System, 4 Point Lining Method, Corrections to be Applied in 4 Point Lining Method, Modes of Tamping using 4-Point Lining Method (Only for curves), 3 Point Lining Method, Corrections to be applied in 3- Point Lining, Determination of Target Versine Values for the 3-Point Lining Method, Mode of Tamping using 3-Point Lining Method, Comparison between 3 Point and 4 Point Lining System, Levelling of Track, Mode of working for levelling, General Lift, Input of the Lifting Values, Survey and working of Tamping Machines in Design Mode, Works required Before, During and After Tamping, Working Principle of Dynamic Track Stabilizer, Modes of working of Dynamic Track Stabilizer, Working of DTS.

**c) Ballast cleaning and handling machines:**
Ballast Cleaning Machines (BCM), Types of Ballast Cleaning Machines, Working Principle and Capability of Ballast Cleaning Machines, Works Required Before, During and After Deployment of Ballast Cleaning Machines.

**d) Track relaying machines:**

Track Relaying Machines, Working Mechanism and Capability of Track Laying Equipment, Pre-Relaying Operations, Operation During Block, Post Relaying Operations, Working Mechanism of TRT, Operations Prior to Deployment of TRT, Operations During The Block of TRT, Post Block Operations for TRT, Precautions During TRT Working

**e) Rail Grinding Machines:**
Rail Grinding Machine (RGM) (Purpose & Advantage), Grinding Strategy, Working Parameters of RGM, Monitoring Equipment for Grind Quality, Quality Inspection of Grinding, Preparatory Works for Introduction of RGM, Pre-Block Activity Before Deploying RGM, Operation During RGM Block, Post Grinding Operation

**f) Planning and deployment of Machines:**

Pre-requisites for Deployment of Track Machines on Construction Projects/Other Agencies, Minimum Duration of Blocks, Through Tamping and Spot Attention.

**g) Rules for movement and block working**:

Provision of G&SR, Operation and Working of Track Machine, Competencies of Track Machine Staff, Safety Equipment, Rules for Operation – General, Important Instructions and Precautions (Protection of Work Site, Fouling of Adjacent Lines, Information to Level Crossings etc), Failure and Accidents of Track Machines, Speed Certification for Track Machines, Special Precautions while working in Special Circumstances (Ghat Sections, Night Working).

**h) Periodical maintenance and associated infrastructural facility:**
Maintenance Schedule for Various Track Machine, Types of Workshops, Functions of Central Periodic Overhauling Workshop (CPOH), Functions of Zonal Machine Depot (ZMD), Functions of Satellite Depot, Functions of Mobile Workshop, Functions of Camping Coach Workshop.

**i) Track Machine Manpower**

Training (Officers, SSEs/JEs/TM(s), Technical Staff, Machine Assistant), Roster

**13. Miscellaneous:**

**a) Engineering plant:**

Control of plant and machinery, engineering plant reserve, plant register; valuation of plant; maintenance; storage and repairs; requisitioning of plants; use of plant at site; maintenance of log books; hiring out of engineering plant; examination of boilers of the engineering department.

**b) Explosives:**

Issue of Instructions on use of explosives; observance of rules, carriage of explosives, Protection of trains and Railway property, precautions to be observed during blasting, Misfire with electrical method of firing, explosives disposal, destruction of explosives

**c) Management of Engineering Stores:**

Reference to code and Rules; procurement of stores; requisition; receipt and issue of challans; claims of short receipts; etc.; custody of stores - classification, handling and storage, Account head of stores - operation, records and returns; disposal of released and surplus stores - return to stores Depot, disposal by auction; verification of stock and adjustment for shortage/excesses.

**d) Law and Order**

Railway Police; lodging complaints; cooperation with railway police; cognizable offences; non cognizable offences; powers of arrest by railway staff; warrant against railway staff; action by railway staff in case of attempted sabotage; answering of court summons; Prevention of trespass disposal of human bodies found run over; disposal of cattle found dead on the line.

**Syllabus for 70% Selection for Promotion to Group 'B' post of ASTE in Signalling & Telecommunication Department**

## Part – A - Professional Subjects

### I. Signalling :

- Basics of Signalling
- Principles of Interlocking, Signal Interlocking Plan, Route holding principles, Table of Control
- Colour Light Signal concepts
- Signalling Elements – Relays, Cables, LED Signals, Point Machines, Track Circuits (DC, AC & AFTC), Axle Counters (SSDAC & MSDAC), Block instruments, Integrated Power Supply, Interlocked Level Crossing Gates and Data Loggers
- Automatic Signalling
- Intermediate Block Signalling, BPAC, UFSBI
- RE Modifications
- Relay Interlocking concepts - Metal to Carbon, Metal to Metal, Panel Interlocking and Route Relay Interlocking
- Electronic Interlocking – Principles, Configuration, Interface logic, Application logic, VDU logic, FAT, SAT, Technical System Approval
- Earthing, Lightning and Surge protection arrangements
- Train Protection Systems – TPWS, Kavach
- Centralised Traffic Control (CTC) , Train Management System (TMS)
- Execution of S&T Infrastructure works – Planning, Execution, CRS sanction, Documentation, Testing and Commissioning

### II. Telecommunications –

- Outdoor and Indoor Telecom cable system, jointing procedures, and maintenance and fault localisation methods, laying practices and precaution at work site
- Control Communication, OFC based, VoIP based, Emergency Control Communication, Voice Logger, COA
- Telephone Instruments, Signalling principles of Telephone Exchanges, Automatic, ISDN, and VoIP Telephone Exchanges
- PCM-TDM Principles, PD multiplexers, SDH principles and SDH equipment's
- Modulation techniques and radio propagation
- VHF, UHF, Tetra, GSM-R, LTE-R
- OFC Communication systems, OFC Splicing, Measurements and laying practices
- Data Communication and IP networks, IP-MPLS, Data networks of IR, PRS, UTS, FOIS, TMS, NMS, Wi-Fi at stations, Firewalls/UTM, Cyber security and Wireless security
- Public address system, Passenger information systems and VSS

### III. Codes & Manuals

- General Rules

- Railways (Opening for Public Carriage of Passengers) Rules
- Indian Railways schedule of dimensions
- Indian Railway Signal Engineering Manual
- Indian Railway Telecom Manual
- Accident Manual
- Block working Manual
- Extracts of Operating manual for Indian Railways, Indian Railways manual of AC Traction Maintenance and Operation and Indian Railways Permanent Way Manual relevant for Signal & Telecom Engineers

**IV. Workshop Practices**

- Raw material processing
- Workshop Machines and their utilisation
- Overhauling procedure and practices
- Inspection and testing of components
- Testing procedures of Block Instruments , Relays, Point Machines, IPS, EoLB, Track Feed Battery Chargers, EKTs, Control Panels and Mechanical Items
- RDSO approval procedure and Renewal
- Production Management Plan
- Quality control and Safety Practices
- Calibration of instruments and machines
- ISO/IMS Certification for workshops
- Scrap disposal
- Workshop suspense
- Costing of products
- Incentive schemes

**Part-B - Official Language**

Official Language - Official Language Policy, Act, Rules, Incentive Schemes etc.

**Syllabus for 30% LDCE for Promotion to Group 'B' post of ASTE in Signalling & Telecommunication Department**

## Part – A - General

### I. Current Affairs and General Knowledge

- This section would contain questions of general interest and importance, which is acquired by general observation or reading without specific text book study. Subjects of national importance as well as achievements of Railways are also to be covered. The standard of General Knowledge shall not be more rigorous than Matriculate level.

### II. General Mathematics

- Arithmetic and Statistical operations, Graphs, Fractions, Percentage, Sampling & Averages
- Geometry – Areas & Volumes up to Higher Secondary /12$^{th}$ Standard level
- Algebra, Simultaneous Equations etc up to Higher Secondary /12$^{th}$ Standard level

### III. Physics & Basic Electricity

- Units & Measurements
- Mechanics – Newton's Law of motion, Velocity & Acceleration, Work, Energy, Power
- Mechanical properties of solids and fluids
- Heat & work, expansion of solids, liquids & gases
- Ohm's law, Coulomb's law, Faraday's Law, Voltage, Current & Resistance, Kirchhoff's Laws, Wet & Dry Batteries, Power Factor
- Fleming's Law, Lenz's Law, Simple Motors & Dynamos, Generators, Principle of working of Transformer, Relay, Fuse, Circuit Breaker
- Semi conductor devices – P-N diode, Transistors, FETs, Applications
- Power supply, AC & DC, Rectifiers

### IV. Digital Electronics & Information Technology

- Principles of Digital Electronics – Boolean Algebra, Digital Devices and their applications
- Information Technology – Generations, PC specifications, Operating systems – Windows, Linux and Application Software.

## Part – B - Professional Subjects

### I. Signalling :

- Basics of Signalling
- Principles of Interlocking, Signal Interlocking Plan, Route holding principles, Table of Control
- Colour Light Signal concepts

- Signalling Elements – Relays, Cables, LED Signals, Point Machines, Track Circuits (DC, AC & AFTC), Axle Counters (SSDAC & MSDAC), Block instruments, Integrated Power Supply, Interlocked Level Crossing Gates and Data Loggers
- Automatic Signalling
- Intermediate Block Signalling, BPAC, UFSBI
- RE Modifications
- Relay Interlocking concepts - Metal to Carbon, Metal to Metal, Panel Interlocking and Route Relay Interlocking
- Electronic Interlocking – Principles, Configuration, Interface logic, Application logic, VDU logic, FAT, SAT, Technical System Approval
- Earthing, Lightning and Surge protection arrangements
- Train Protection Systems – TPWS, Kavach
- Centralised Traffic Control (CTC) , Train Management System (TMS)
- Execution of S&T Infrastructure works – Planning, Execution, CRS sanction, Documentation, Testing and Commissioning

## II. Telecommunications

- Outdoor and Indoor Telecom cable system, jointing procedures, and maintenance and fault localisation methods, laying practices and precautions at work site
- Control Communication, OFC based, VoIP based, Emergency Control Communication, Voice Logger, COA
- Telephone Instruments, Signalling principles of Telephone Exchanges, Automatic, ISDN, and VoIP Telephone Exchanges
- PCM-TDM Principles, PD multiplexers, SDH principles and SDH equipments
- Modulation techniques and radio propagation
- VHF, UHF, Tetra, GSM-R, LTE-R
- OFC Communication systems, OFC Splicing, Measurements and laying practices
- Data Communication and IP networks, IP-MPLS, Data networks of IR, PRS, UTS, FOIS, TMS, NMS, Wi-Fi at stations, Firewalls/UTM, Cyber security and Wireless security
- Public address system, Passenger information systems and VSS

## III. Codes & Manuals

- General Rules
- Railways (Opening for Public Carriage of Passengers) Rules
- Indian Railways Schedule of dimensions
- Indian Railway Signal Engineering Manual
- Indian Railway Telecom Manual
- Accident Manual
- Block working Manual
- Extracts of Operating manual for Indian Railways, Indian Railways manual of AC Traction Maintenance and Operation and Indian Railways Permanent Way Manual relevant for Signal & Telecom Engineers

## IV Workshop Practices

- Raw material processing
- Workshop Machines and their utilisation
- Overhauling procedure and practices
- Inspection and testing of components
- Testing procedures of Block Instruments , Relays, Point Machines, IPS, EoLB, Track Feed Battery Chargers, EKTs, Control Panels and Mechanical Items.
- RDSO approval procedure and Renewal
- Production Management Plan
- Quality control and Safety Practices
- Calibration of instruments and machines
- ISO/IMS Certification for workshops
- Scrap disposal
- Workshop suspense
- Costing of products
- Incentive schemes

## Part - C – Official Language

Official Language Policy, Act, Rules, Incentive Schemes etc

# SYLLABUS FOR PROMOTION TO GROUP 'B' POST OF ADME/AWM THROUGH 70 % SELECTION IN MECHANICAL DEPARTMENT

Paper will be of two parts one part comprising of questions from establishment, Financial Rules and Stores which will be mandatory for all. Other part will be of Technical questions from four streams of Mechanical Department. Questions on PU are included in workshop segment. Question on Rajbhasha will be of optional nature of fifteen marks

Part-A consists of questions from Establishment, Financial rules & Stores.
Part-B Contains Professional portion in Four sections representing various streams of Mechanical Branch – Divisional working and Disaster management, Diesel Locomotives, Carriage & Wagon, Workshops and PU,

## PART-A (Stores Rules)

### STORES

- Classification of Stores
- Procedure of drawal of Stores
- Indenting Procedures
- Procurement methods-Local purchase, Spot purchase, Bulletin tender, Advertised tender, Limited tender, Tender Committee, Direct Purchasing
- Schedule of Powers
- Incoming inspection requirements
  Scrap disposal

## PART-B-Professional Portion

### DIVISIONAL WORKING & OPERATIONS MANAGEMENT

Working Time Table

- Working in Control Office including Passanger grievance redressal portals e.g. Rail Madad
- Accident Classification, definitions, ART Ordering, Role of Supervisors & officers at accident site Management. ,Accident investigation including proforma for measurement
- 140 ton Crane Construction & safety in operations

### DIESEL LOCOMOTIVES

- Basic Features and troubleshooting of HHP locomotives
- Preventive maintenance schedules
- Latest design improvements in diesel locomotives to reduce failures on line.
- Features of GE Locomotives
- Design improvements in bogies to make them fit for high speed operation
- Air Brake system of diesel locos including working of compressors and vigilance control devices and their maintenance
- Cooling water system of diesel engines

- Fuel oil system of diesel engines
- Control of lubricating oil consumption
- Safety devices used on diesel engines and locomotives
- Trouble shooting on locomotives running on the railways
- Fuel Economy on diesel locomotives
- Thermal loading of engine components
- Under gear maintenance
- Suspension bearings, wheels
- Electric Systems of Diesel Locomotive
- Load Box Testing
- MEMU ,DEMUs-types, systems & trouble shooting
- Basics of DPRS ( Distributed Power Rolling Stock)
- Introduction to GM Locomotives and its systems

CARRIAGE & WAGON

Coaching stock- preventive maintenance schedules in Coaching Depots including IOH.POH, SS2, SS3 Schedules in shops

- Wagon Stock-preventive maintenance including ROH in depots and POH Schedule in shops ,Ride Index, Anti Telescopic features

- IRCA Rules for reject able defects
- ICF & LHB Coach Bodies and their maintenance in sick line/shops
- Generic details of train set
- Casnub Bogie & its modifications for high speed
- Corrosion repairs to caching and goods stock
- Couplers & Draw gear, Train Parting , Brake Binding & measures to avoid the same
- Water availability in coaches
- Fire prevention on Trains
- Air Brake System-Twin Pipe & single pine. Under frame & bogie mounted brake system, Test rig, Checking timings, trouble shooting, DV defects, slack adjustment methods. Brake Binding, WSP system, FIBA, Air spring suspension in LHB coaches
- Passenger amenity items
- OBHS , CTS and other coach cleaning systems
- Maintenance Pattern of freight trains including CC Rakes & Coaching stock maintenance including Revised Policy Circular-4
- Neutral Train Examination
- Maintenance of various components like DV, SAB, PEASD
- Latest design improvements of Carriage & Wagons to improve their performance and speed potential
- LHB Coaches & BLC Wagons
- Construction, Design & Maintenance of special purpose Wagons

WORKSHOPS and Production Units

- System of labour accountal GA Cards for time keeping documents, tally sheets, Job/Route Cards, inspection & rate fixing
- Rules & Calculations under incentive scheme
- Paints & painting systems
- Different types of machine tools such as lathes, milling machines, shapers, planers, cutting tools & cutting speeds
- CNC machines
- CLW Pattern of Incentive Scheme, Group Incentive Scheme
- Different types of welding processes, welding defects
- Wheels, tyres & axles and their ultrasonic testing
- Heat treatment of ferrous items such as surface hardening, annealing, normalizing etc
- Roller Bearing & Cartridge Bearings
- Injury free features in coaches
- Material handling
- Design of coaches and wagons
- Basic concepts of casting and Heat treatment methods
- Manufacturing and Heat treatment process of wheels and axles
- Factory Layout
- Process flow chart of Production Units
- Machinery and Plant maintenance

**Rajbhasha**

Optional questions of 15 marks

# SYLLABUS FOR PROMOTION TO GROUP 'B' POST OF ADME/AWM THROUGH 30% LDCE IN MECHANICAL DEPARTMENT

Paper will be of two parts one part will be of General questions comprising questions from General Knowledge, Quantitative aptitude, Applied Mechanics, General Science Information Technology and EnHM.and other sections Comprising of questions from establishment , financial rules and Stores will be and Technical questions from four streams of Mechanical Department. Questions on PU are included in workshop segment. Question on Rajbhasha will be of optional nature of fifteen marks

## Section A

## GENERAL PORTION-

GENERAL KNOWLEDGE

This section would contain questions of general interest and importance which is acquired by general observation and reading without specific text book study. Subjects of national importance as well as achievements of railways will also be covered. The standard of General Knowledge shall not be more rigorous than Matriculation.

Quantitative Aptitude

- Arithmetic & Statistical Operations Graphs, Fractions, Percentage, Sampling & Averages
- Geometry-Area & volume upon Higher Secondary/Class 12 Standard
- Algebra, simultaneous equations etc upon Higher Secondary/Class 12 Standard
- Questions on General quantitative aptitude

Applied Mechanics

Various Engineering materials and their properties, Bearings, Stress & Strain, Fatigue, Hardness, Corrosion & Surface finish.

General Science

- Mechanics: Newton's Laws of Motion, Velocity & Acceleration, work, energy, power, Archimedes Principle etc.
- Temperature & its measurement
- Mechanics Velocity & Acceleration, work done & horse power etc upon Higher Secondary/Class 12 standard
- Heat & Work, Expansion of Solids Liquids & Gases
- IC Engines, Gas Turbines, Heat Recovery & Thermal Efficiency, Supercharging & Intercooling
- Ohm's Law, Coulombs Law, Faraday's Laws, Voltage, Current & Resistance, wet & dry batteries, power factor
- Simple Motors & Dynamos-Principle & working, transformer, relay, fuse, circuit breakers
- Power Supply, AC & DC, Rectification

INFORMATION TECHNOLOGY

Familiarity with Personal Computer Specs- Processor, RAM, Hard Disk, Floppy, CD, Multimedia etc.

- Basic MS Word, Excel and Power Point

- Basic Local Area Networks: Servers, Hubs, Switches, Structured Cabling, Nodes, Network applications
- Using Internet: Email, Browsing, Searching
- General Information on various portals used in Indian Railways including GEM,UDM,IREPS,FMM,E Office etc.

EnHM

- Environment, Quality Management Systems ISO 9000 & ISO 14000
- Environment management system (ISO 14001),
- solid waste management rules
- CTE ( Consent to Establish) CTO, ( Consent to operate)
- Water act, air act,
- hazardous waste management act
- water policy of Indian Railways

## Section B

Part-A consists of questions from Establishment ,Financial rules & Stores.

Part-B Contains Professional portion in Four sections representing various streams of Mechanical Branch – Division & Workshop Management, Diesel Locomotives, Carriage & Wagon and Workshops,

## PART-A (Stores Rules)

STORES

- Classification of Stores
- Procedure of drawal of Stores
- Indenting Procedures
- Procurement methods-Local purchase, Spot purchase, Bulletin tender, Advertised tender, Limited tender, Tender Committee, Direct Purchasing
- Schedule of Powers
- Incoming inspection requirements
  Scrap disposal

## PART-B-Professional Portion-

DIVISIONAL WORKING & OPERATIONS MANAGEMENT

- Working Time Table
- Working in Control Office including Passanger grievance redressal portals e.g. Rail Madad
- Accident Classification, definitions, ART Ordering, Role of Supervisors & officers at accident site Management. ,Accident investigation including proforma for measurement
- 140 ton Crane Construction & safety in operations

DIESEL LOCOMOTIVES

- Basic Features and troubleshooting of HHP locomotives
- Preventive maintenance schedules
- Latest design improvements in diesel locomotives to reduce failures on line.
- Features of GE Locomotives
- Design improvements in bogies to make them fit for high speed operation
- Air Brake system of diesel locos including working of compressors and vigilance control devices and their maintenance
- Cooling water system of diesel engines
- Fuel oil system of diesel engines
- Control of lubricating oil consumption
- Safety devices used on diesel engines and locomotives
- Trouble shooting on locomotives running on the railways
- Fuel Economy on diesel locomotives
- Thermal loading of engine components
- Under gear maintenance
- Suspension bearings, wheels
- Electric Systems of Diesel Locomotive
- Load Box Testing
- MEMU ,DEMUs-types, systems & trouble shooting
- Basics of DPRS ( Distributed Power Rolling Stock)
- Introduction to GM Locomotives and its systems

CARRIAGE & WAGON

Coaching stock- preventive maintenance schedules in Coaching Depots including IOH.POH, SS2, SS3 Schedules in shops

- Wagon Stock-preventive maintenance including ROH in depots and POH Schedule in shops ,Ride Index, Anti Telescopic features
- IRCA Rules for reject able defects
- ICF & LHB Coach Bodies and their maintenance in sick line/shops
- Generic details of train set
- Casnub Bogie & its modifications for high speed
- Corrosion repairs to caching and goods stock
- Couplers & Draw gear, Train Parting , Brake Binding & measures to avoid the same
- Water availability in coaches
- Fire prevention on Trains
- Air Brake System-Twin Pipe & single pine. Under frame & bogie mounted brake system, Test rig, Checking timings, trouble shooting, DV defects, slack adjustment methods. Brake Binding, WSP system, FIBA, Air spring suspension in LHB coaches
- Passenger amenity items
- OBHS , CTS and other coach cleaning systems

- Maintenance Pattern of freight trains including CC Rakes & Coaching stock maintenance including Revised Policy Circular-4
- Neutral Train Examination
- Maintenance of various components like DV, SAB, PEASD
- Latest design improvements of Carriage & Wagons to improve their performance and speed potential
- LHB Coaches & BLC Wagons
- Construction, Design & Maintenance of special purpose Wagons

WORKSHOPS and Production Units

- System of labour accountal GA Cards for time keeping documents, tally sheets, Job/Route Cards, inspection & rate fixing
- Rules & Calculations under incentive scheme
- Paints & painting systems
- Different types of machine tools such as lathes, milling machines, shapers, planers, cutting tools & cutting speeds
- CNC machines
- CLW Pattern of Incentive Scheme, Group Incentive Scheme
- Different types of welding processes, welding defects
- Wheels, tyres & axles and their ultrasonic testing
- Heat treatment of ferrous items such as surface hardening, annealing, normalizing etc
- Roller Bearing & Cartridge Bearings
- Injury free features in coaches
- Material handling
- Design of coaches and wagons
- Basic concepts of casting and Heat treatment methods
- Manufacturing and Heat treatment process of wheels and axles
- Factory Layout
- Process flow chart of Production Units
- Machinery and Plant maintenance

**Rajbhasha**

Optional questions of 15 marks