

# **AMC-4 : TRANSPORTATION ENGINEERING**

## **PART I**

### **1. ROAD PLANNING:**

Classification of Highways, Planning of a Highways, Fact Finding Surveys and Other Surveys, Reconnaissance, Preliminary Survey, Final Location Survey, Cross- section and Profiles, Surface Drainage Survey, Soil Investigation, Road Materials Investigation, Rights of Way Investigation, Bridge Sites, Survey Report, Annexure to the Survey Report, Phasing of Road Programme, Saturation System, Road Planning in India.

### **2. GEOMETRIC DESIGN OF HIGHWAY:**

Introduction, Width of Formation, Right of Way, Width of Pavement, Camber, Gradient, Speed, Sight Distances, Curves and Their Radii, Road Cross –sections, Road- Rail Level Crossings.

### **3. LOW COST ROADS.**

Introduction, Earth Roads, Kanker Roads, Garvel Roads, Traffic Bound Macadam, Water Bound Macadam Roads.

### **4. ROAD CONSTRUCTION MATERIALS:**

Introduction, Crushed Rock Aggregate, Gravels , Sand , Slag, Requirements of a Good Road Aggregate, Aggregate Testing, Bituminous Materials, Specifications and Tests for Bituminous Materials , Cement Testing.

### **5. STABILISED ROADS.**

Introduction, Stabilizers, Soil Stabilized Roads or Mechanical Stabilized Roads, Sand- Clay Roads, Gravel Surfaced Stabilized Roads, Soil- Lime-Pozzolen Stabilized Roads, Soil-Cement Stabilized Roads, Bitumen Stabilized Roads.

### **6. FLEXIBLE PAVEMENT:**

Introduction, Type of Pavement, Structure of the Flexible Pavement, Group Index Method, California Bearing Ratio (C.B.R.) Method for the Design of Flexible Pavement.

### **7. BITUMINOUS ROADS.**

Introduction, Types of Bituminous Pavements, Surface Treatment, Intermediate Type Surfaces, High-type Bitumen Pavement.

### **8. RIGID PAVEMENTS:**

Introduction, Advantages of Cement Concrete Pavement, Disadvantages of Cement Concrete Pavement, Stressess in Cement Concrete Pavement, Concrete, Design of Concrete Pavement, The Sheets Formulas, The Westerguard Formulas, Picket's Equation, Kelly's Equation, Spanglar's Equation, Allowable Design Stress, Slab Thickness, Reinforcement in Concrete Slabs, Pavement Joints, Longitudinal Joints, Transverse Joints, Construction Equipment, Preparation of the Sub- grade and Sub-base, Forms, Concrete of Pavement.

### **9. DRAINAGE:**

Introduction, Surface Drainage, Sub-Soil Drainage, Drainage of Marshy Soil, Bridges and Culverts, Causeways, Guidelines for the Design of Small Bridges and Culverts

### **10. TRAFFIC ENGINEERING:**

Introduction, The Road Users and Their Characteristics, The Vehicles and Vehicular Characteristics, Road Characteristics, Traffic Census of Traffic Surveys, Traffic Volume Study, Cycle Variation in Traffic Volume, 30<sup>th</sup> Highest Hourly Volume, Traffic Projection Factor, Origin and Destination Studies, Roadway Capacity , Road Parking and Studies, Parking Stalls , Parking Areas, Parking Lots and Parking Garages, Road Accidents and Studies , Traffic Regulation, Traffic –control Devices, Investigations, Clover-leaf, By- pass, Ribbon Development, Street and Highway Lighting.

## **PART II**

### **11. HISTORY OF RAILWAYS IN INDIA:**

Introduction, Development of Railways in India, Comparison of Roads and Railways ,Gauges.

**12.ALIGNMENT SURVEY AND PROJECT REPORT:**

Introduction, Track Alignment and Gradient, Survey for Track Alignment, Traffic Survey, Reconnaissance Survey, Preliminary Survey, Location Survey, Survey Dragings and Projects Reports.

**13.PERMANENT WAY**

Rails , Railway Sleepers, Ballast, Rail Fastenings and Fixtures.

**14.RAILWAY POINTS AND CROSSINGS AND JUNCTIONS:**

Introduction, Turnouts, Switches , Crossing, Design of Turnout , Types of Track Junctions, Design of Simple Junctions.

**15.RAILWAY TRACK DRAINAGE:**

Introduction, Importance of Drainage, Requirement of Drainage System, Drainage systems, Cross Drainage, Drainage Problems.

**16.MAINTENANCE OF RAILWAY TRACK:**

Introduction, Advantages of Good Maintenance, Daily Maintenance , Periodical Maintenance, Modern Railway Track, Maintenance of Track Alignment, Maintenance of Drainage, Maintenance of Track Components, Maintenance of Points and Crossings, Maintenance of Level Crossing , Maintenance Organization, Track Recording , Mechanical Maintenance, Mechanized Maintenance, Measured Shovel Packing, Directed Maintenance of Track, Inspection of Track- Track Recording and Track Tolerances

**17.RAILWAY STATION YARDS AND EQUIPMENT:**

Introduction, Site Selection, Types of Selections, Station Yard, Requirements and Amenities of a Railway Station, Level Crossing, Types of Equipment, Platform, Water Column, Triangle, Ashpit, Ashpan, Turntable, Buffer Stop, Catch Siding or Slip Siding, Scotch Block, Derailing Switch, Sand Hump, Fouling Marks, Cow Catcher, Weigh Bridge, Loading Gauges, End- Loading Ramp, Traverser, Cranes, Engine Shed.

**PART III**

**18.INTRODUCTION:**

General, Advantage of Tunnelling, Economics of Tunnelling.

**19.TUNNEL SURVEYING:**

Introduction , Initial Surveys, Setting Out of the Tunnel Centre- line on the Surface, Triangulations, Setting Out Inside Tunnels, Settings Out Steeply Inclined Tunnels, Transferring of Alignment Through Shafts, Curves, Adjustments at Meeting Points of Tunnels.

**20.DESIGN OF TUNNELS:**

Introduction, Rail-road Tunnels , Vehicular Tunnels, Rapid Transit Tunnel.

**21.METHOD OF TUNNELING IN SOFT STRATA:**

Introduction, Tunnelling in Firm Ground, Tunnelling in Soft Ground, Tunnelling in Running Ground, Shield Method of Tunnelling , Method of Supporting Roof and Sides in Multiple Drift Method.

**22.METHOD OF TUNNELLING IN ROCK:**

Introduction, Tunnelling Method, Sequence of Operation for Construction of Tunnel in Rocky Strata, Drilling, Blasting, Inspection and Handling Misfires.

**23.SAFETY PRECAUTION IN TUNNELLING WORK:**

Introduction, Safety Programme, Medical and Other Facilities, Electrical Installation and Lighting, Underground Excavation, Ventilation, Scaling and Mucking.

**24.TUNNEL SHAFTS AND CAISSONS:**

Introduction, Timber Shafts, Rock Shaft, Steel Lining for Shaft, Shaft by Caissons, Drop Shafts, Freezing Process for Shafts.

**25.TUNNEL LINING:**

Objects of Linings, Materials for Tunnel Linings,Design of Tunnel Linnings, Concrete Linings.

**26.TUNNEL VENTILATION , DUST PREVENTION AND LIGHTING:**

Object of Ventilation, Natural Ventilation, Mechanical Ventilation Methods, Ducts, Ventilation Shafts, Fans, Ventilation Buildings, Dust Control, Lighting, Mucking,

**27.DESIGN OF TUNNELS CONVEYING WATER:**

General, Design of Tunnels Conveying Water: Hydraulic Design, Design of Tunnel Supports.

