

31042 TRANSPORTATION ENGINEERING

DETAILED SYLLABUS

Unit I HIGHWAY ENGINEERING

1.1 INTRODUCTION General – Development of Roads in India - Modes of transportation - Nagpur Plan - Ribbon development - Advantages of Roads - Importance of roads in India - Requirements of an ideal road - Indian Road Congress - Objects of Highway planning - Classifications of Highways.

1.2 HIGHWAY PAVEMENTS Objectives - Types of Pavement - Flexible and Rigid Pavements - Comparative study of Flexible and Rigid pavements - Factors affecting the design of pavements - Other types of pavements (Description not reqd.)

1.3 GEOMETRICAL DESIGN OF HIGHWAYS General - Road structure - Right of way - Land width - Width of formation - Road Camber - Super elevation - Sight distances - Road gradient - Road Curves - Horizontal curves - Vertical curves - Types - Widening of pavement on horizontal curves.

1.4 TRAFFIC ENGINEERING Objectives - Traffic surveys - Road accidents - Causes of road accidents - Preventive measures - Parking - Methods of parking - Road junctions (Grade intersections and Grade separators) - Traffic signals - Advantages - Types of road signs - Expressways.

1.5 SUB GRADE SOIL Significance - Soil mass as a three phase system - Grain size classification - Atterberg limits - Definition and description - I S Classification of soils - Compaction Definition - Objects of compaction - Standard Proctor Compaction test - Shear strength - Definition - importance - Direct shear test.

1.6 ROAD ARBORICULTURE AND LIGHTING Objects of Arboriculture - Selection of trees - Location of trees - Highway lighting - Benefits.

Unit II HIGHWAY ENGINEERING

2.1 HIGHWAY ALIGNMENT AND SURVEYS Definition - Principles for ideal highway alignment - Factors affecting highway alignment - Surveys - Engineering surveys - Reconnaissance, Preliminary and Location surveys - Project Report and Drawings - Highway Re-alignment projects.

2.2 ROAD MACHINERIES Excavating equipments - Tractor, Bull dozer, Grader, Scraper, J C B - Compaction equipments - Road roller - Types and description - Equipment for Bituminous road.

2.3 LOW COST ROADS General - Classifications - Earthen road, Gravel road, Water Bound Macadam roads - Construction with sketches - Advantages and disadvantages - Maintenance - Soil stabilization - Methods.

2.4 BITUMINOUS ROADS General - Advantages and disadvantages - Bituminous materials used - Types of Bituminous roads - Surface dressing - Types - Bituminous Concrete - Maintenance of Bituminous roads.

2.5 CEMENT CONCRETE ROADS General - Advantages and disadvantages - Methods of construction of cement concrete roads with sketches - Construction procedure for concrete roads. 2.6 HILL ROADS

Factors considered in alignment - Formation of hill roads - Hair pin bends - Retaining and Breast walls.

Unit III RAILWAY ENGINEERING

3.1 INTRODUCTION Introduction to Railways - Classifications of Indian Railways - Rail Gauges - Types - Uniformity in gauges - Loading gauge - Construction gauge.

3.2 RAILS General - Functions of rails - Requirements of an ideal rail - Types of rail sections - Length of rails - Welding of rails - Wear of rails - Coning of wheels - Hogged rails - Bending of rails - Creep of rails - Causes and prevention of creep.

3.3 SLEEPERS AND BALLAST Functions of Sleepers - Types of sleepers - Requirements of sleepers - Materials for sleepers - Sleeper density – Ballast- Functions of Ballast - Requirements of ballast - Materials used as ballast. 3.4 RAIL FASTENINGS AND PLATE LAYING Rail joints - Types - Rail fastenings - Fish plates - Fish bolts - Spikes - Chairs and Keys - Bearing plates - Blocks - Elastic fastenings - Anchors and anti-creepers - Plate laying - Methods of plate laying - PQRS method of relaying. 3.5 MAINTENANCE OF TRACK Necessity - Maintenance of Track, Bridges and Rolling stock.

Unit IV RAILWAY ENGINEERING

4.1 STATIONS AND YARDS Definition of station - Purpose of railway station - Types of stations - Wayside, Junction and Terminal stations - Platforms - Passenger and Goods platforms - Definition of Yard - Types of yard - Passenger yard, Goods yard, Marshalling yard and Locomotive yards - Level crossings.

4.2 STATION EQUIPMENTS General - Engine shed - Ash pits - Examination pits - Drop pits - Water columns - Triangles - Turn table - Traversers - Scotch

Block - Buffer stops - Fouling marks - Derailing switch - Sand hump - Weigh bridges.

4.3 POINTS AND CROSSINGS Purpose - Some definitions - Turnouts - Right hand and left hand turnouts - Sleepers laid for points and crossings - Types of switches - Crossings - Types of crossings.

4.4 SIGNALLING General - Objects of signalling - Types of signalling - Based on function and location - Special signals - Control of movement of trains - Different methods - Following train system - Absolute block system - Automatic signalling - Pilot guard system - Centralized traffic control system.

4.5 INTERLOCKING Definition - Principles of interlocking - Methods of interlocking - Tappets and locks system - Key system - Route relay system - Improvements in interlocking and signalling.

4.6 RAPID TRANSPORT SYSTEM General - Underground railways - Advantages - Tube railways - Its features.

Unit V BRIDGE ENGINEERING

5.1 INTRODUCTION Bridge: Definition - Components of bridge - IRC loadings - Selection of type of bridge - Scour - Afflux - Economic span - Waterway - Factors governing the ideal site for bridge - Alignment of bridge - Factors to be considered in alignment.

5.2 FOUNDATIONS Functions of foundation - Types of foundations - Selection of foundations - Control of ground water for foundation - Caisson foundation - Cofferdam - Types.

5.3 CLASSIFICATION OF BRIDGES Classification according to IRC loadings, Materials, Bridge floor, Type of superstructure - Culverts and Causeways - Classifications with sketches - Conditions to construct causeways.

5.4 SUBSTRUCTURE Abutments - Types - Piers - Types - Wing walls - Types.

5.5 SUPERSTRUCTURE Types - Description - Simple bridge - Types according to bridge floor - Continuous bridge - Cantilever bridge - Balanced cantilever bridge - Arch bridge - Bow-string girder type bridge - Rigid frame bridge - Suspension bridge - Continuous steel bridges - Steel arched bridges.

5.6 BRIDGE BEARINGS Definition - Purpose - Importance of bearings - Types of bearings - Elastomer bearings.