

Electric Traction [ET]

B.E. Sem. VIII [ELEC]

(Elective – II)

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical & Oral	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. Electric Traction- Principle and History

- Systems of traction. The Indian Scenario, vis-à-vis Electric traction.
- Present day State of art.
- Electric traction as a Viable Transport Strategy for the 21st century.
- Advantages of Electric Traction over other systems of traction.
- Choice of traction system - Diesel- Electric or Electric.

2. Mechanics of train movement

- Speed - time curve for train movement.
- Requirement of tractive effort and T-N curve of a typical train load.
- Specific energy consumption. & Factors affecting SEC.

3. Adhesion, types of suspension and mechanism of torque transmission

- Adhesion & Coefficient of adhesion,
- Suspension and mechanism of torque transmission,
- Concept of Weight Transfer & Effect of unsprung mass and wheel diameter

4. Traction Motor

- Type of traction motor best suited for traction duties.
- Available motor characteristics and their suitability for traction duties.
- Optimization of design and construction features for improved power to weight ratio.

5. Traction motor drives - Principles and gear

- Power Factor and Harmonics
- Tractive Effort and Drive Ratings
- Important Features of Traction Drives
- Conventional DC and AC Traction drives
- Semiconductor Converter Controlled Drives
- DC Traction using Chopper Controlled Drives
- Poly phase AC motors for Traction Motors
- DC /AC Traction employing Polyphase motors
- Diesel Electric Traction
- Traction control of DC locomotives and EMU's
- Traction control system of AC locomotives
- Control gear
- PWM control of induction motors
- Power & Auxiliary circuit equipment (Other than traction motors)

6. Protection of electric locomotive equipment and circuits (Safety considerations and monitoring)

- Broad strategy for protection
- Surge protection
- Overload protection of main power circuits
- Earth fault protection of power of auxiliary circuits
- Protection from over-voltage and under-voltage
- Differential protection of traction circuits
- Protection against high and low air pressure in the compressed air circuit.
- Temperature monitoring.
- Protection of transformer by Buchholz relay
- Protection against accidental contact with HT equipment
- Protection against fires.

7. Electric Traction Sub-Systems (Overhead Equipment)

- Overhead Equipment (OHE)
- Sectionalizing
- Bonding of Rails AND Masts
- Materials Employed in OHE

8. Railway Signalling:

- Block Section Concept, Track Circuits
- Interlocking Principle
- Train speed and signalling
- Solid state Interlocking
- Automatic Warning Systems
- CAB signaling
- Signaling level crossing

9. Electric Traction Sub-Systems (Power Supply Installations)

- Lay out design of 137/25 KV Traction Substation/ Protection
- Booster Transformers and Return Conductor.
- Salient 2x25 kv AC System/ SCADA.

Reference Books :

1. Electric Traction (*Upadhyay J. & Mahindra S.N*) Allied Publishers Ltd., 1st Ed.
2. Principle of 25 KV Overhead Equipments (*Rao P.S.*) R.(Nasik) Printpack Pvt Ltd, 1st Ed,
3. Fundamentals of Electric Drives (*Gopal K Dubey*) Narosa Publishing.
4. Modern Electric Traction (*Partab*) Dhanpat Rai & Sons

Websites :

www.irien.com (Indian Railways Institute of Electrical Engineering, Nasik Road)
www.wr.railnet.gov.in/bctweb/ELECTRICAL.htm
www.scrailway.gov.in

