

ELECTRICAL SYLLABUS PART B: PAPER 1 AND PAPER 2

A. REGULATORY PRACTICE

(a) Registration of Engineers Act 1967 (Revised 2015)

- A Guide to Good Engineering Practice for M&E Engineers

(b) Street, Drainage and Building Act (Act No 133)

- Assume understanding of topics covered under “Common Paper”:
 - Introduction and a general overview of the function of the Act.
 - ‘Principal Submitting Person’ and his role
 - Submitting Person and his role
 - UBBL as a by-law under the Act
 - Ministry and Government agency responsible.
 - Street lighting
- Role of Professional Engineer with Practising Certificate (PEPC) Electrical in support of PSP’s duties and responsibilities.

(c) Uniform Building By-Law

- UBBL as a uniform building design code for Peninsular Malaysia. Sabah and Sarawak will have their own, similar in concept.
- Introduction to UBBL and general description of the various Parts of the UBBL
- Part VII – Fire Fighting. Understanding the ‘life safety’ concept as prescribed in the UBBL (exit discharge, fire barriers/walls)
- Responsibilities of PEPC in the certification process of Certificate of Completion and Compliance issuance.
- Lighting requirement
- Requirements of MS 1525
- Lightning protection requirements to MS IEC62305
- Lifts requirement
- Part VII – Fire Fighting Requirement on purpose/hazard class for building, fire barriers, etc
- Part VIII – Fire Protection System, Fire Alarm, Fire Detection, Emergency power, Power Isolation, etc.

- (d) The Electricity Supply Act 1990 (Act 447), Sabah Electricity Supply Enactment 2024 and Sarawak Electricity Ordinance (Chapter 50)
- Ministry and Government agency responsibilities
 - Introduction to the Acts, Ordinances, Rules and Regulations, their functions; Electrical safety; regulator for electricity production, distribution and retail (licensing for IPPs, approval of tariffs, license premises, notification of accidents etc.; electrical efficiency)
 - Competent persons registered under the Act in the submission procedure
 - Safety and 'control item' list under the Regulations.
 - Independent Distribution License for private power distribution scheme
 - Other Regulations under the Act:
 - Efficient Management of Electrical Energy Regulations (2008);
 - Electricity Regulations 1994 (Peninsular Malaysia);
 - Electricity Rules 1999 (Sarawak).
 - Codes (Grid, Distribution, etc)
- (e) Electricity Enactment 2024 (Sabah) and Sarawak Electricity Ordinance (Chapter 50) (2023).
- Only similar concepts as outlined in item (j) will be examined.
- (f) The Energy Commission Act 2001 (Act 610)
- Ministry and Government agency responsible.
 - Part III, Functions and Powers of the Commission
 - Suruhanjaya Tenaga's circulars and guidelines
- (g) Sustainable Energy Development Authority Act (Act 726)
- (h) Renewable Energy Act 2011 (Act 2023)
- (i) The Energy Efficiency and Conservation Act (EECA) (2024)
- (j) Factories and Machinery Act 1967
- (k) Electric Passenger and Goods Lift Regulations

- (I) Fire Services Act 1988 (Act 341)
 - General overview of electrical works only.
- (I) The Communications and Multimedia ACT 1998 (Act 588)
 - Ministry and Government agency responsible
 - Functions and powers of the DG of the Multimedia Commission
 - General overview of the ACT on telecommunications
 - Guidelines and Technical Codes from MCMC
 - General overview of requirements for submissions

B. THE ELECTRICITY SUPPLY SYSTEM

- (a) Generation, transmission and distribution system

Electrical transmission and distribution systems in Peninsular Malaysia, Sabah and Sarawak.

 - General description of the public distribution system in Peninsular Malaysia, Sabah and Sarawak (500kV, 275kV, 132kV, 33kV, 11kV, 400/230V), generation levels.
 - Generation systems (Smart Grid, PV, etc).
 - Design and application of power supply to private installation; EHV intake, 33kV intake, PPU for township, 33kV and 11kV switch rooms for private installation, single-chamber & double chamber substation. Load estimation and substation design; tariff selection. TNB Supply Handbook, Contribution Charges Handbook, Sabah Electricity Supply Enactment 2024 and Sarawak Electricity Rules.
 - Power factor correction (tariff requirement and method of PF correction).
 - Power metering requirements
 - Standby Power supply system: generator set, battery pack, changeover system.
 - MV and HV intake design configurations (1-feeder, 2-feeder, H-formation, double-bus, single-bus system).
 - Fault level and Basic Insulation Level design considerations.
 - Safe operating procedures for the distribution system.
- (b) HV Systems

- Transmission System

Basic understanding and role of the transmission system in the electricity supply industry as listed below.

- Transmission voltages in Malaysia
- Equipment (and their key characteristics thereof) used in transmission networks eg overhead lines, underground cables, circuit breakers, disconnectors, transformers, protection relays, DC systems etc. The terms commonly used to rate equipment, e.g. rated current, short-circuit breaking capacity or, in the case of transformers, impedance voltage etc.
- Common configurations of high voltage switchyards and their effects on operation and maintenance, understanding of the types of clearances as applied to transmission technology,
- Earthing as applied to high voltage substations and basic knowledge of key concepts in IEEE Standard 80 - Guide for Safety in AC Substation Grounding.

- Generation System

Basic understanding and identification of main elements used in the generation of electricity in Malaysia as listed below,

- Knowledge of the process of power generation in hydro, coal-fired and gas turbine combined cycle power plants, solar panels, etc.
- Knowledge of the design and operating characteristics of the synchronous generator, and keywords used to describe the rating of the generator, e.g., MVA, short-circuit ratio, types of impedances, etc
- Commonly used excitation systems; able to explain the function from block diagrams, etc
- Knowledge of common electrical configurations of a power plant, the role of the generator, generator transformer, unit and station service transformer, circuit breakers, DC and UPS systems
- Knowledge of generator synchronization and standby schemes
- Safety and equipment isolation procedures for maintenance

(c) MV Systems and Equipment

- MS/IEC 60076; Transformer types (cast resin, ONAN, etc)

- MV switchgear; load break switch, isolator, circuit breakers, arc breaking/suppression technology in switching (vacuum, arc chute, magnetic suppression, SF6 etc.)
- MV System and Substation Design
- MV cabling systems
- Earthing system for MV substations

(d) L.V. Distribution System

- MS IEC 60364 – Electrical Installation in Buildings (Part 1 to Part 7).
 - MS 1979 : Electrical Installation of Buildings – Code of Practice
 - MS 1936 : Electrical Installation of Buildings – Guide to MS IEC 60364
- The above cover topics such as types of earthing (TNC, TNS, TT, TI), SPD, selection of protection devices, wiring installation, voltage drop calculation, cable selection, verification, etc.

(e) Power Quality (PQ) and Electromagnetic Compatibility (EMC)

- General appreciation of PQ and EMC requirements for TNB submissions

(f)

C. SYSTEM PROTECTION

(a) Basic concepts

- Classification of protection (zone, unit protection, pilot wire).

(b) Short Circuit & System Discrimination

- Understanding of short circuit, short-circuit calculation, per-unit calculation.
- Discrimination and system protection, protection setting, protection discrimination curve.

(c) Types of protection relays

- Overcurrent and Earth Fault
- Motor Protection
- Transformer Differential Protection
- Transformer Restricted Earth Fault
- Cable Feeder Protection

- Overhead Line Protection (Auto-reclosure, Distance, Line Differential)
- Generator Protection

(d) Instrumentations

- Types and classes of metering CTs and PTs; Protection Class (Class X, Class XPXX, knee point voltage), Metering Class.

(e) Unit Protection Requirements

- Transformer protection
- Generator Protection

D. BUILDING SYSTEMS

(a) Lighting Systems

- Knowledge of various lighting concepts:-
 - Luminous intensity (candela)
 - Luminance (candela/sqm)
 - Illuminance (Lux)
 - Colour rendering index (CRI)
- The different types of light sources and colour effects selections for energy efficiency.
- Local authorities' requirements
- Daylighting concept for energy efficiency (MS 1525)
- Switching and control strategies for energy savings
- MS ISO 8995; Lighting of Indoor Work Places

(b) Lightning Protection

- MS IEC 62305-Protection of building structures against lightning strikes. Risk assessments and measures to protect building structures.

(c) Fire Protection For Electrical Engineers

- MS 1745 Fire Alarm and Detection System
- BS5839 Part 8 and 9 (Emergency call system)

- Emergency standby generating system
- Emergency lighting and exit signs
- Fire lifts

(d) Extra Low Voltage Systems

- Telecommunication System
 - Fixed network infrastructure and space planning
 - In-building structured and fibre cabling
- Public address
- SMATV Systems
 - System design
- CCTV Surveillance System
 - Camera and video fundamentals
 - Equipment selection
 - Analogue versus digital
- Security System
 - Security components
 - Perimeter and interior protection
 - Access control
- Building Automation System
 - Control – type of inputs and outputs
 - System infrastructure
 - Integration with other systems such as Energy Management System, etc

(e) Vertical and Horizontal transportations

- Control and Safety issues
- Harmonics mitigation

(f) Hazardous Environment

- Hazardous area classifications
- Risks mitigation
- Equipment and cable selection

(g) Energy Efficiency

MS1525: Code Of Practice On Energy Efficiency And Use Of Renewable Energy For Non-Residential Buildings

- Application for Green Building Index grading of Buildings

E. INFRASTRUCTURE

(a) Exterior Lighting

- Roads, junctions, roundabouts, interchanges and housing.

MS 825 Part 1; Code of Practice for the Design of Road Lighting – Part 1:
Lighting of Roads and Public Amenity Areas

- Roads, junctions, roundabouts, interchanges, toll plazas and housing.
- Boulevards
- Open car park
- Electrical infrastructure for BESS (Battery Energy Storage System), NEM (Net Energy Metering), LSS (Large Scale Solar) and EV (Electric Vehicle) charging infrastructure.
- MS 825: Part 2: 2008 – Code of Practice for the Design of Road Lighting – Part 2: Lighting of Tunnels
 - Tunnels, underpasses and vehicular box culvert (VBC)
 - MS 825: Part 4, Part 5 and Part 6
- Department of Civil Aviation (DCA)
 - Obstruction lights (ICAO Annex 14)
- Wharves, ports, jetties

(b) Telecommunication Infrastructure

- External manholes and ducting system
- Termination and interfacing points

F. COMMON REQUIREMENTS

(a) Work acceptance

- Understanding Technical Standards, types of standards (basic standards, component standards, assembly standards).

- Understanding certifications: basic safety certification, conformance certification, type test certification.
 - Types of work certification: first-party, second-party, and third-party certification.
 - The work acceptance procedures in the construction process.
 - Commissioning (types of tests and commissioning procedures)
- (b) Ingress Protection (IP) Classifications for Enclosures
- (c) Switchboard forms of segregation – IEC 61439-2

Weightage for the Questions for the Examination

The following tables serve as a guide to the weightage of the syllabus allotted for the examination questions in the various disciplines.

Electrical paper

No. of multiple-choice questions = 40

No. of subjective questions = 3 out of 5

Category	Proposed Weightage in %
Regulatory Practice	20
The Electricity Distribution System	25
System Protection	15
Building Systems	30
Infrastructure	10

Note: Subjective questions may comprise a combination of some or all of the above categories