



PROFESSIONAL COMPETENCY EXAMINATION (PCE)

The structure, the format, the syllabi...

Presented by:

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AIM OF THE PROFESSIONAL COMPETENCY EXAMINATION

The Professional Competency Examination will test the candidates within the limits of “**professional engineering services**” as defined by the Engineers Act in the engineering disciplines of civil & structural, mechanical and electrical engineering (primarily for the CONSTRUCTION industry).

The examination will test the candidate’s knowledge, experience and application of:

- ❖ Regulations and rules of engineering practice by BEM
- ❖ Statutory laws, design codes, regulations
- ❖ Standards of professionalism and ethical behaviour imposed by BEM



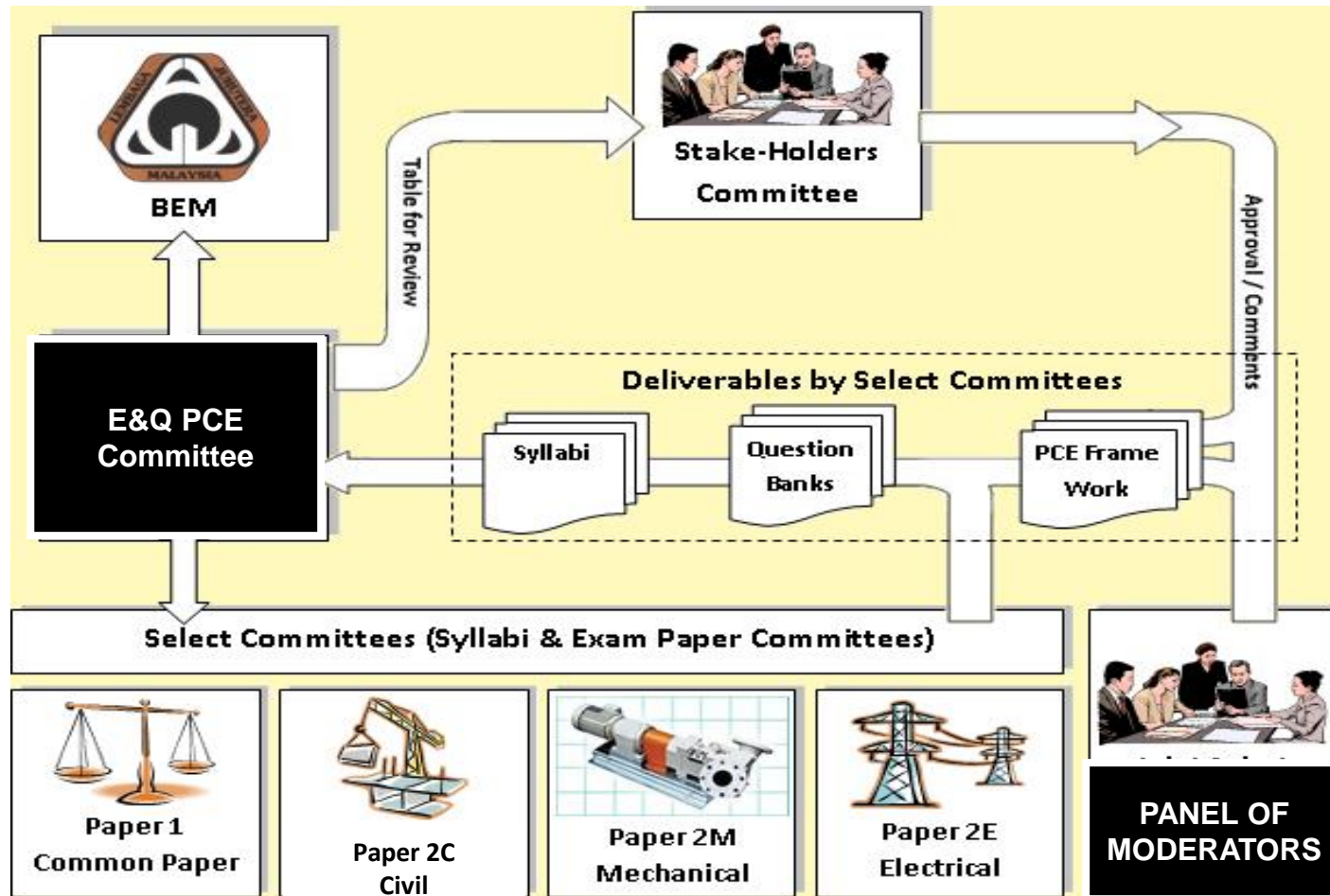
In a nutshell

the **Professional Assessment Examination (PAE)** tests an Engineer on **WHAT HE KNOWS** *but not on what he does not know* to obtain his PE

the **Professional Competency Examination (PCE)** tests a PE on *what he does not know but OUGHT TO KNOW* to obtain his PEPC



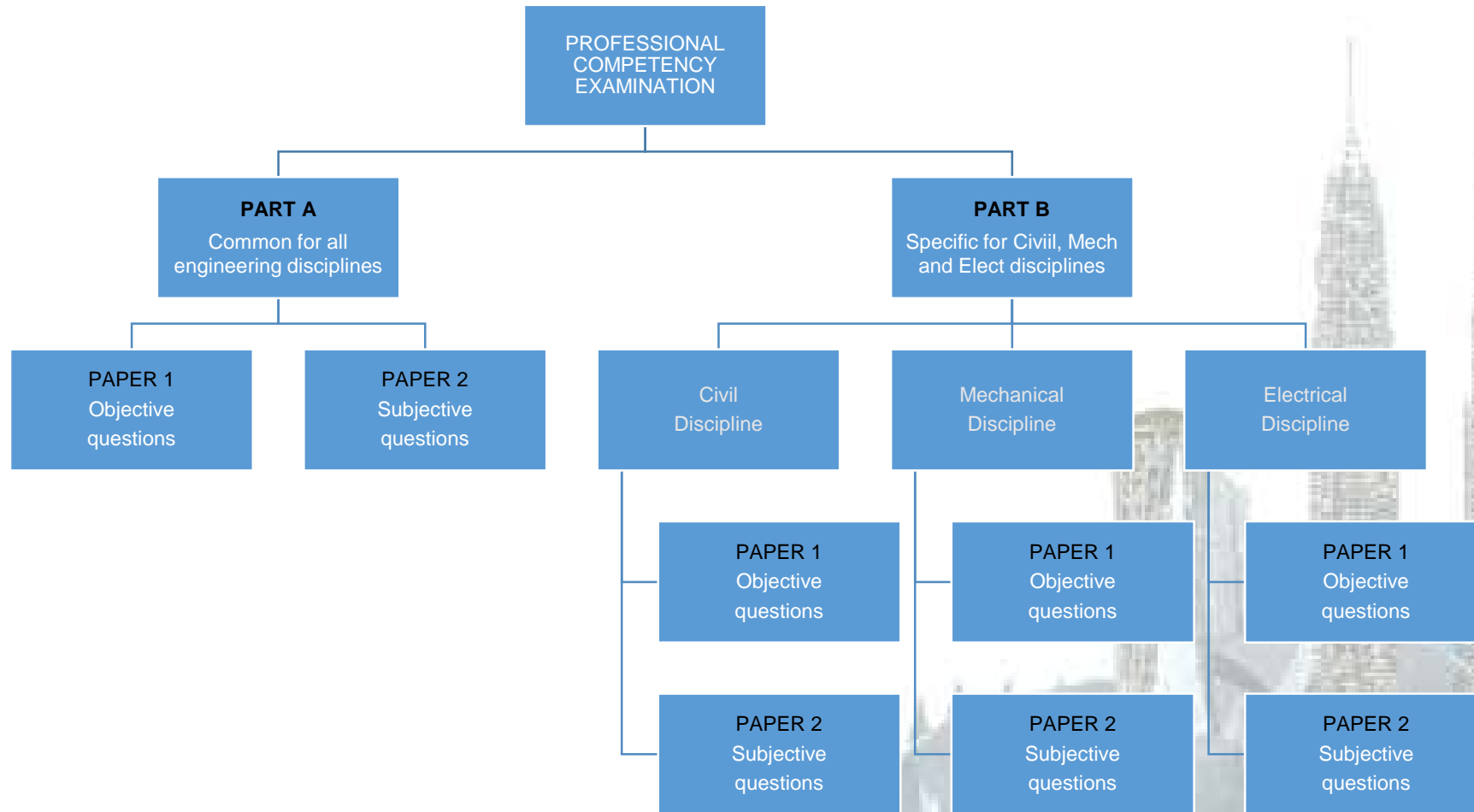
PROFESSIONAL COMPETENCY EXAMINATION COMMITTEE UNDER E&Q



Confidentiality of the Competency Examination is important



SUMMARY OF THE EXAMINATION SYSTEM



Primarily developed for the Construction Industry



ELIGIBILITY TO SIT FOR THE EXAMINATION

- Professional Engineers wishing to sit for the PCE shall apply to BEM by completing a prescribed form and pay the prescribed fees
- Eligible candidates for the PCE must be a Professional Engineer registered with the Board in the appropriate discipline
- Candidates seeking registration as a licensed **Submitting Person** in the construction industry must have the relevant working experience in the field of engineering which he wishes to practise
- On approval of the candidate's application by the Board, the candidate is allowed to sit for the examination



EXAMINATION REGULATIONS FOR THE PCE

PCE COMPRISES 2 PARTS: PART A & PART B

Regulations for the examination:

- Compulsory to pass both the papers (1 & 2) in Part A and Part B
- Candidates must pass both the papers (1 & 2) for Part A and Part B at one sitting
- If a candidate passes Part A but fails Part B, he is allowed to re-sit the latter, and vice versa
- The 'pass' result for Part A or Part B is valid for 3 years and there is no limit on re-sit attempts on the other (failed) Part within the 3-year period
- After expiry of the 3-year period, the candidate will have to re-sit both Parts again.



PCE: PART A

PART A – COMMON PAPER

- * To be taken by all candidates
- * Non-technical in nature
- * Tests candidate's knowledge on laws governing the profession, the responsibility of the professional towards the general public and standards of professionalism and ethical behaviour, etc.
- ❖ There are two papers for this Part A – Paper 1 and Paper 2



PCE: PART B

PART B – PAPER ON INDIVIDUAL DISCIPLINE

- * To be taken by candidates in the relevant discipline in which they are permitted to practise
- * Technical in nature
- * Test candidate's competency within his respective field of practice on :
 - Regulations and rules of practice by BEM
 - Statutory laws, design standards, regulations, etc.
- ❖ There are two papers for this Part B – Paper 1 and Paper 2



GENERAL DESCRIPTION OF THE PCE

COMPRISES 2 PARTS: PART A & PART B

| Subject | Time Allocated | Description |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>PART A</u> Common Paper | <u>Consists of 2 papers</u> Paper 1 (Objective) Paper 2 (Subjective) 1.5 + 1.5 hours | Common paper is to be taken by all candidates. Non-technical in nature to test candidates on knowledge of laws governing the profession, responsibility of a professional towards the general public, standards of professionalism and ethical behaviour, etc. Consists of two papers, namely Paper 1 and Paper 2. Candidates must pass both papers at one sitting. |
| <u>PART B</u> Paper specific for each discipline | <u>Consists of 2 papers</u> Paper 1 (Objective) Paper 2 (Subjective) 1.5 + 1.5 hrs | Technical paper on Civil & Structural; Mechanical; and Electrical engineering. Candidates to sit for Papers in the relevant discipline they are permitted to practise. Test candidate's competency within his respective field of practice. Consists of two papers, namely Paper 1 and Paper 2. Candidates must pass both papers at one sitting. |



FORMAT & STRUCTURE OF THE PCE

| PART A | | TIME ALLOCATED | FORMAT |
|---------------------------------------|---------|----------------|-------------------------------------------------------------|
| Common Paper (For all disciplines) | Paper 1 | 1.5 hours | 40 objective questions. Passing mark 50% |
| | Paper 2 | 1.5 hours | Answer 3 out of 5 subjective questions. Passing mark 50% |
| PART B | | TIME ALLOCATED | FORMAT |
| Civil Paper | Paper 1 | 1.5 hours | 40 objective questions. Passing mark 50% |
| | Paper 2 | 1.5 hours | Answer 3 out of 5 subjective questions. Passing mark 50% |
| Mechanical Paper | Paper 1 | 1.5 hours | 40 objective questions. Passing mark 50% |
| | Paper 2 | 1.5 hours | Answer 3 out of 5 subjective questions. Passing mark 50% |
| Electrical Paper | Paper 1 | 1.5 hours | 40 objective questions. Passing mark 50% |
| | Paper 2 | 1.5 hours | Answer 3 out of 5 subjective questions. Passing mark 50% |



Examiners/Markers for the Examination

Applicable for both Part A and Part B - Paper 2:

- ❖ Each Candidate's answer script will be independently marked by 2 examiners.
- ❖ A Candidate will pass or fail in Paper 2 only when both examiners pass or fail him.
- ❖ In the event, one examiner passes him while the other fails him, then a third examiner will be appointed to mark a fresh set of the answer script. The third examiner's result will be deemed as final.



PART A – Common Paper 1 & 2

| Category | Weightage |
|---------------------------------------------|-----------|
| Engineers Act & Professional Practice | 35% |
| Common Laws, Local Acts & Local Authorities | 30% |
| Construction Contract Laws | 25% |
| ECP Business & Management | 10% |

Note: Questions may comprise combination of some or all of the above categories.



Engineers Act & Professional Practice - 35%

Laws & regulations governing the engineering profession in Malaysia

Engineer's responsibility to society and to the public

Professionalism on a conceptual basis, ethical conduct and professional practice

- REA, Regulations, Circulars, LOR, etc

Common Laws, Local Acts & Local Authorities - 30%

Overview of laws having relevance - UBBL/SBO, CCC/CFO/OC, etc

Construction Contract Laws - 25%

Basic knowledge of Contract Laws practised locally with respect to the Construction Industry - CIPAA, CIDB, etc

ECP Business & Management - 10%

An in-depth knowledge of the functions of the consulting engineer during various stages of project implementation - BEM Model Form of Agreement, SOF, etc

Management of ECP business - Companies Act, EPF, SOCSO, etc



PART A: Common Paper 1 - SAMPLE QUESTION

Q1. A local Consultant enters into an agreement with a foreign Contractor to carry out engineering consultancy services for a Turnkey Contract in that country. Mid-way through the project, war breaks out in that country. What is the effect?

- A. The Contract is valid and enforceable
- B. The Contract is frustrated
- C. The Contract is suspended
- D. The Contract is discharged
- E. The Contract is void

[Construction Contract Law]



PART A: Common Paper 1 - SAMPLE QUESTION

- Q2. Which of the following statements is/are true?
- a) Only Mechanical PEPCs can submit active fire protection plans
 - b) Only Civil or Mechanical PEPCs can submit passive fire protection plans for industrial buildings
 - c) PEPCs of any discipline can submit active fire protection plans
 - d) Only Electrical PEPCs can submit electrical plans
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- A. a)
 - B. a) and d)
 - C. a), b) and d)
 - D. c)
 - E. b), c) and d)

[Professional Practice, Local Laws]



PART A: Common Paper 1 - SAMPLE QUESTION

Q3. Which of the following statements is false?

- A. The BEM Scale of Fees is mandatory
- B. A Sole Proprietorship practising as an ECP must be registered with BEM
- C. All ECPs must be registered with BEM
- D. Professional Fees based on man months do not contravene the BEM Scale of Fees
- E. For a private project, a consultant may exclude provision of supervision and hence need not charge the corresponding professional fees

[REA & ECP]



PART A: Common Paper 2 - SAMPLE QUESTION

Q1. A contractor applies for Extension of Time (EOT) before his contract completion period expires. The Contract Administrator does not respond and the original contract completion date is passed. One month later, the Contract Administrator issues a V.O. for additional works to the Contractor. The Contractor refuses to carry out the V.O. works. What can the Contract Administrator do under this situation?

[Construction Contract Law, Common Law]



PART A: Common Paper 2 - SAMPLE QUESTION

Q2. A Consultant has carried out substantial works on a project and the Employer encounters financial difficulties. He suspends the project. On resumption, he terminates the Consultant's employment citing use of in-house consultants to complete the works due to financial constraints. What is the legal effect of the termination and what financial compensation can the consultant seek?

[Construction Contract Law and REA]



PART B – Civil Paper 1 & 2

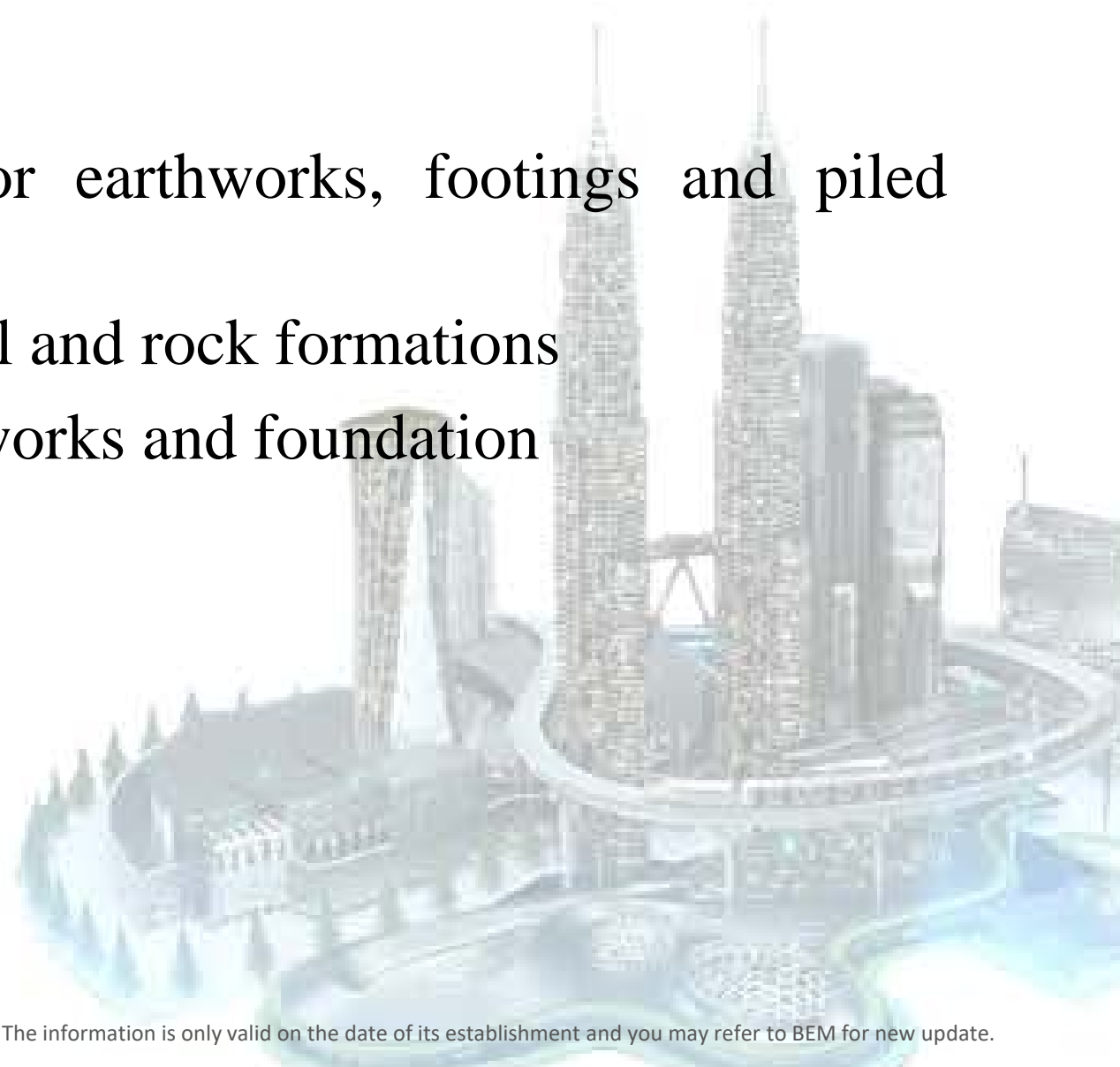
| Category | Weightage |
|-----------------------------------------------------|-----------|
| Geotechnical | 20% |
| Infra-structural | 30% |
| Structural | 40% |
| Regulations, submission and Contract administration | 10% |

The above percentage is only a broad guideline and may be varied.



Geotechnical Works

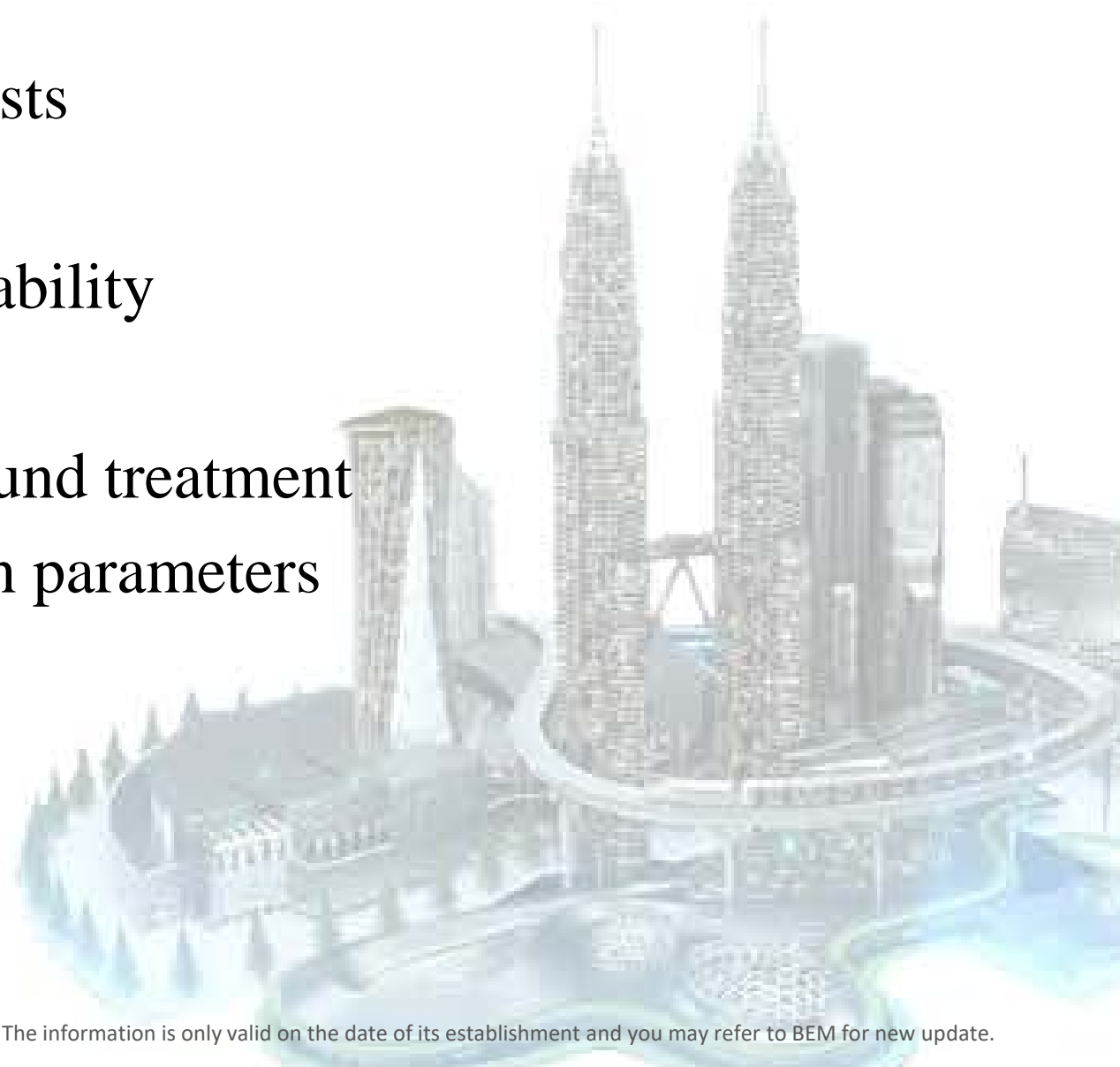
- Planning of soil investigation for earthworks, footings and piled foundations
- General knowledge of different soil and rock formations
- Types of laboratory tests for earthworks and foundation
- Interpretation of test results





Earthworks

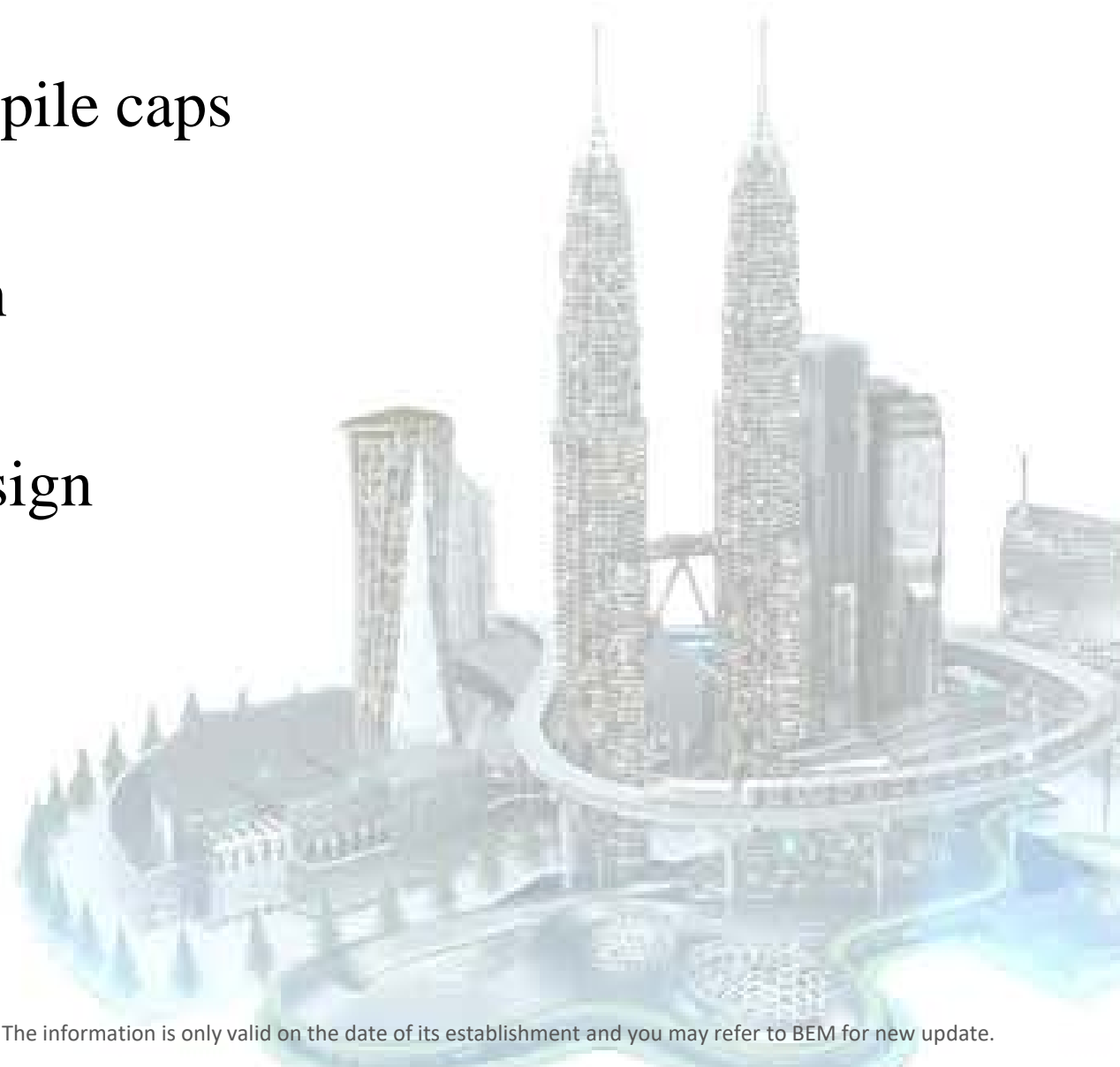
- Suitable filling materials and tests
- Construction control at site
- Hill side development, slope stability
- Settlement analysis
- Slope stabilisation and soft ground treatment
- Selection of subsoil/rock design parameters
- Erosion control
- Ground monitoring





Structures

- Foundation design of pads, raft, pile caps
- Earth retaining structures
- Temporary works for excavation
- Basic structural analysis
- Concrete and steel structures design
- Pre- stressed concrete
- Composite design





Water and Sewerage

- Acts and design guidelines
- Water demand and sewerage discharge
- Net work analysis, hydraulic calculation
- Master planning requirements





Road and Drainage

- Arahan Teknik JKR and MSMA
- Vertical and horizontal alignment
- Acceleration, deceleration, and junction
- Superelevation
- Road pavement design
- Hydrological calculation
- Drainage design
- Storage pond





Regulations, submission and Contract Administration

- Certificate of Completion and Compliance
- Streets, Drainage and Buildings Act
- Fire requirements for civil engineers
- Civil engineer as PSP
- Administration of Civil Engineering Contract





PART B: Civil Paper 1 - SAMPLE QUESTION

Q1. Which of the following statements is true for circular columns?

- A. Minimum no. of bars is 8, size of bar is not less than 10 mm
- B. Minimum no. of bars is 8, size of bar is not less than 12 mm
- C. Minimum no. of bars is 6, size of bar is not less than 10 mm
- D. Minimum no. of bars is 6, size of bar is not less than 12 mm
- E. None of the above

[Code of Practice]



PART B: Civil Paper 1 - SAMPLE QUESTION

- Q2. What is the minimum residual pressure head for an external hydrant system required by Bomba.
- A. 3.0 m
 - B. 7.5 m
 - C. 12.5 m
 - D. 10.0 m
 - E. 9.0 m

[Bomba requirements]



PART B: Civil Paper 1 - SAMPLE QUESTION

Q3. What is the fire resistance requirement for a concrete structure of an underground basement car-park?

- A. One hour
- B. Half an hour
- C. Two hours
- D. Four hours
- E. One & half hours

[UBBL/SBO]



PART B: Civil Paper 2 - SAMPLE QUESTION

Q1. A 3-storey basement car park is to be built with an excavation of approximately 15.0 m from the existing ground level. The water table is 1.0 m below the existing ground level. You are required to provide a solution on the structural system for the retaining walls of the basement.

Note:

This question can be answered in ½ hr. if it is expected that the answer is only descriptive in nature.

However if a plan of basement & sections are provided with the soil properties then this question will take at least 1 hr where it is expected that sketches and typical details are to be produced with supporting calculations.

[Retaining structures & safeguarding public interest]



PART B: Civil Paper 2 - SAMPLE QUESTION

Q2. You are the infrastructure engineer for a housing development scheme for a 500-acre project. What is your advice to the Developer, Planner and Architect in terms of requirements for drainage, sewerage, water reservoirs, retention ponds and earthwork for the application for master plan?

Note:

Question can be answered in 1/2 hr provided that the answer is descriptive in nature. The layout plan of the housing scheme with contours is provided and rough estimate of sizes and areas where these services should be located. It tests a candidate's knowledge in master planning.

[Acts and submission]



PART B – Mechanical Paper 1 & 2

| Category | Weightage |
|-----------------|-----------|
| ACMV | 40% |
| Fire Protection | 30% |
| Hydraulics | 20% |
| Other Systems | 10% |

Note: Questions may comprise combination of some or all of the above categories.



Mechanical Syllabus Outline - 1

A. Relevant Regulations

- Street, Drainage and Building Act 1974
- Uniform Building By-Laws 1984
- Factories and Machinery Act 1967
- Occupational Safety and Health Act 1994
- Fire Services Act 1988 and Regulations
- Water Services Industry Act 2006 and regulations



Mechanical Syllabus Outline - 2

B. Air-Conditioning and Mechanical Ventilation

- Basic refrigeration cycle and psychometric chart
- Types of air-conditioning systems and local applications
- Air-conditioning design considerations
- Mechanical ventilation systems and design
- Smoke control and pressurization systems
- Energy conservation considerations



Mechanical Syllabus Outline - 3

C. Fire Protection

- Fire safety requirements for buildings
- Design considerations and standards for
 - Wet systems such as hydrants, Wet / Dry risers, Hose reels, Automatic sprinklers, etc.
 - Dry systems such as fire alarm and detection, firemen intercom, fire annunciation, CMS, etc.
 - Fixed gaseous extinguishing systems,
 - Emergency power, lighting, exit signs,
 - Fire lifts
- Submission to Bomba for design and installation approval



Mechanical Syllabus Outline - 4

D. Hydraulics

- SPAN Uniform Technical Guidelines
- Cold water supply, storage and distribution
- Hot water generation and circulation
- Sanitary and waste plumbing
- Booster pumps, sewage pumps and accessories
- Submission to water licensees such as Syabas
- Submission to local authorities for sanitary



Mechanical Syllabus Outline - 5

E. Other Systems

- Lifts and escalators
- LPG / natural gas storage and distribution
- Submissions to JKKP
- Submissions to Suruhanjaya Tenaga dan Gas





PART B: Meachanical Paper 1 - SAMPLE QUESTION

Q1. Which of the following is not applicable for active fire designs?

- A. MS 1472
- B. MS 1780
- C. MS 1910
- D. MS 1525
- E. Guide to Fire Protection in Malaysia

[Design codes for Mechanical Services]



PART B: Mechanical Paper 1 - SAMPLE QUESTION

Q2. Which of the following requirement not stipulated in the UBBL or SBO is not true?

- A. Smoke spill system must be provided for any fire compartmented area exceeding 1,000 m²
- B. The first stage wet riser tank cannot be installed above the ground floor
- C. Sprinkler tank may be installed at roof level
- D. A wet riser system cannot contain more than 4 riser stacks
- E. A hose reel system cannot contain more than 8 riser stacks

[UBBL & Bomba]



PART B: Mechanical Paper 1 - SAMPLE QUESTION

Q3. Fire lifts are required for buildings where the topmost occupied floor is;

- A. Over 30.5 m
- B. Over 18.5 m
- C. Over 1,000 m²
- D. Over 18.5 m and 1,000 m²
- E. Over 30.5 m and 1,000 m²

[UBBL & Bomba]



PART B: Mechanical Paper 2 - SAMPLE QUESTION

Q1. You are appointed to design the air conditioning and mechanical ventilation system for the retrofit of a 20-year old, 25-storey Office Building with a nett rentable area of 1500m² per floor. Your client requires for the new air conditioning system to have minimum running costs and with flexibility to cater for after normal office-hour occupation by some of the tenants.

List the types of air conditioning systems you would consider and recommend. Elaborate the reasons for your recommendation and how you would ensure compliance to current local authority requirements. Also list down specific areas not within your responsibility and capability where you need your client to seek expert advice.

[ACMV]



PART B: Mechanical Paper 2 - SAMPLE QUESTION

- Q2. The following complaints have been received from building occupants. Briefly describe what you think are the likely causes of these problems and the solutions you would propose.
- Office occupants seating next to window complain of unsatisfactory air conditioning. Your on-site measurement shows the design temperature of 24°C DB and 55% RH is achieved.
 - Hotel guests complain it takes a long time to get hot water from their toilet showers and the water temperature fluctuates during their showers.
 - The contractor was unable to achieve specified background noise level of NC 25 for the auditorium even though he has followed manufacturer's recommendation of internal duct lining as well as installed silencers.

[ACMV & Hydraulics]



PART B – Electrical Paper 1 & 2

| Category | Weightage |
|---------------------------|-----------|
| Regulatory Practice | 20% |
| Electricity Supply System | 25% |
| System Protection | 15% |
| Building Systems | 30% |
| Infrastructure | 10% |

Note: Questions may comprise combination of some or all of the above categories.



Electrical Syllabus Outline - 1

A. Regulatory Practice

- Registration of Engineers Act 1967
- Street, Drainage and Building Act
- Uniform Building By-Law
- The Electricity Supply Act 1990 and Sarawak Electricity Ordinance
- The Energy Commission Act 2001
- Factories and Machinery Act 1967
- Fire Services Act 1988 (Act 341)
- The Communications and Multimedia Act 1998



Electrical Syllabus Outline - 2

B. Electricity Supply System

- Generation, transmission and distribution system
- High Voltage System
- Generation System
- Medium Voltage System and Equipment
- Low Voltage Distribution System
- Power Quality and Electromagnetic Compatibility



Electrical Syllabus Outline - 3

C. System Protection

- Basic concepts
- Short Circuit & System Discrimination
- Types of protection relay
- Instrumentations
- Unit Protection Requirement

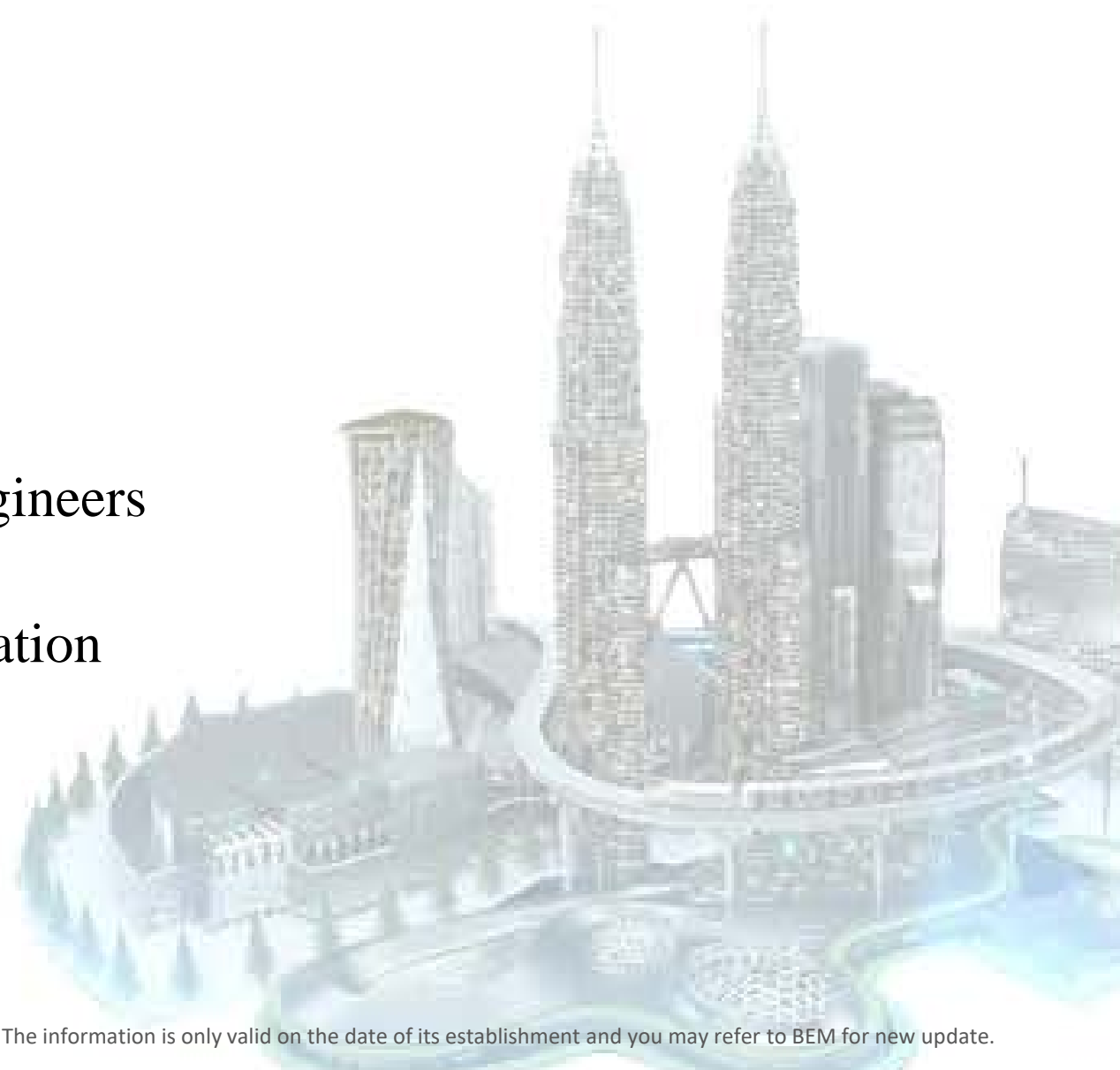




Electrical Syllabus Outline - 4

D. Building Systems

- Lighting System
- Lightning Protection
- Fire Protection For Electrical Engineers
- Extra Low Voltage System
- Vertical and Horizontal transportation
- Hazardous Environment
- Energy Efficiency





Electrical Syllabus Outline - 5

E. Infrastructure

- Exterior Lighting
- Traffic Control System
- Special Systems

Common Requirements

- Work Acceptance
- Ingress Protection (IP) Classification for Enclosures
- Switchboard forms of Segregation



PART B: Electrical Paper 1 - SAMPLE QUESTION

Q1. Which of the following statements does not describe the function of the Minister under “The Electricity Supply Act”

- A. Efficient use of energy
- B. Power to fix tariff for electricity
- C. Competency of persons in charge
- D. Licensing of electrical installation
- E. Control of electrical equipment and plant for safety

[Regulatory Practice]



PART B: Electrical Paper 1 - SAMPLE QUESTION

Q2. Which is the best installation method to minimize eddy current losses in single core cable sheaths ?

- A. Flat formation
- B. Trefoil formation
- C. Alternate formation
- D. Cross bonding of sheaths
- E. Bundle in air

[Electrical Supply System]



PART B: Electrical Paper 1 - SAMPLE QUESTION

Q3. What is expected short circuit current at 400V if a 1000kVA transformer of 11/0.4kV with an impedance of 5% is connected to a 11kV infinite bus ?

- A. 8,000 Amps
- B. 1,250 Amps
- C. 50,000 Amps
- D. 2,886 Amps
- E. 28,868 Amps

[System Protection]



PART B: Electrical Paper 2 - SAMPLE QUESTION

Q1. You are requested to plan the electrical installation for a modern 8-storey commercial building with the following information:

- a. Building aircond with 1x35HP ACPU service basement and ground floor, 7 sets 17HP APU for each floors, 1x7HP and 1x25HP ACPU on the 8th Floor
- b. 1x15HP lift motor at roof and 1x5HP water pump at basement floor
- c. Lighting and other power loads per floor (including basement and ground) at estimated 5kW and 4kW respectively.
- d. The landlord will be responsible for the consumption with respect to aircond on all floors, lift, water pumps, lighting and power in stairs and basement.
- e. The basement floor will house TNB substation and consumer main switch board whilst the rest of the floors will be sublet for offices.

Draw a single line diagram of the installation showing the sizes of main conductors, method of running, rating of switches and metering arrangement on the main intake board and individual metering by the TNB for each floor.

[Building Systems]



PART B: Electrical Paper 2 - SAMPLE QUESTION

Q2. Answer completely the following two questions:

- a) As a electrical consulting engineer, described clearly the general procedures which would be established for acceptance of works under your supervision.
- b) Describe the role of SIRIM certification in the work acceptance procedure.

[Infrastructure & Common Requirements]



PCE TIPS

1. Time Management

Paper 1: 40 Qs in 90 mins - average 2 mins/Q with 10 mins spare for checking/collating

Answer all those questions you know first and then come back to those you are not sure.

Paper 2: 3 Qs in 90 mins - 30 mins/Q.

Use the extra time given at the beginning to read the Qs thoroughly and select the 3 out of the 5 Qs to answer.



PCE TIPS

2. Answer the Long Question directly

Read and understand the Question properly and then answer to the point.

No extra marks will be given for beating round the bush.

Do not 'copy and paste' wholesale from any open books, documents or workshop manuals. You can miss answering the question completely.



Q & A SESSION



THANK YOU



“Committed To Engineering Excellence”

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