BEM ROADSHOW 2023
Sabah & Sarawak

BEMEngineers
BEM_Engineers

All About The

PROFESSIONAL COMPETENCY EXAMINATION (PCE)

Presented by:

Dato' Ir. Prof. Dr. Hassan Basri

BEM PCE Committee

Session 1: 5th July 2023

Grand Ballroom,
Le Meridien, Kota Kinabalu

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Outline of Presentation

1: **Introduction & Background**

2: WHO NEEDS BECOME A PEPC?

3: SO, WHO NEEDS TO SIT FOR THE PCE?

4: About the PCE – All you need to know

Appendix: PCE Syllabus & Sample Questions

1.
INTRODUCTION & BACKGROUND

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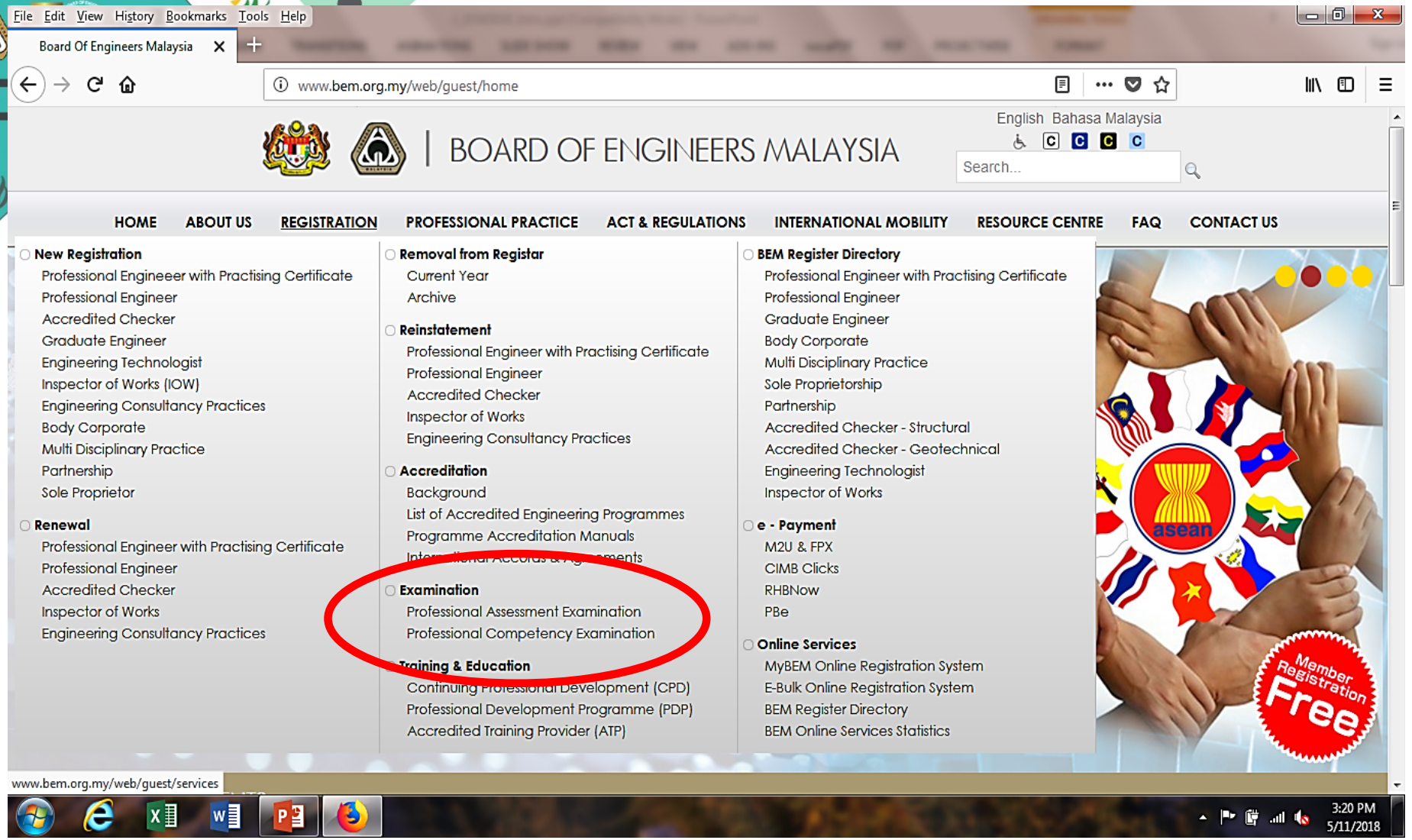

BEM website:
http://www.bem.org.my/web/guest/home

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Impact of the 2015 Amendments of the REA

……primarily driven by the Government's commitments in international trade.

Non-Malaysians are treated equally, can now be Registered Persons, including PE & PEPC.

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Legal Implication:

Registration of Engineers Act - 2015 Amendments

BEM now Registers 5 Categories of Registered Persons : *(new in red)*

"Two-tier registration" system

1. Accredited Checker
2. **Professional Engineer with Practising Certificate (PEPC)**
3. **Professional Engineer (PE)**
4. Graduate Engineer
5. Engineering Technologist
6. Inspector of Works

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What is the purpose of the Registration of Engineers Act ……

What is the point ?

- to safeguard & protect the public

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REASONS FOR INTRODUCTION OF THE PEPC

- The activities of PEPC acting as 'Submitting Person' has a direct and critical impact on public safety and interest. They would need to be examined on their competency.
- Hence the PEPC category has to sit for a PCE – Professional Competency Examination – to secure the submitting license called a Practicing Certificate.

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SAFEGUARD MEASURES IN SUMMARY

TO ENSURE THE QUALITY OF THE SERVICE & PROTECT PUBLIC INTEREST

BOARD OF ENGINEERS

1st. Safeguard Measure
Board register Graduates provided that their under graduate degree meets the standards set

→ **Basic undergraduate degree meets Boards' requirements**

2nd. Safeguard Measure
Board registers Professionals provided they have obtained the required technical competence or obtained it through an accredited programme overseas

→ **Pass the 1st. tier of examination, i.e. the PAE**

3rd. Safeguard Measure
Before the issue of a 'license', the Professional must demonstrate competence in understanding the national & local standards, rules, regulations & laws

→ **Pass the 2nd. tier of examination i.e. the PCE**

4th. Safeguard Measure
The 'license' is renewable every year subject to the Professional have undergone Continuous Professional Development programmes accredited by the Board

→ **Renewable every year subject to CPD. The license is not perpetual**

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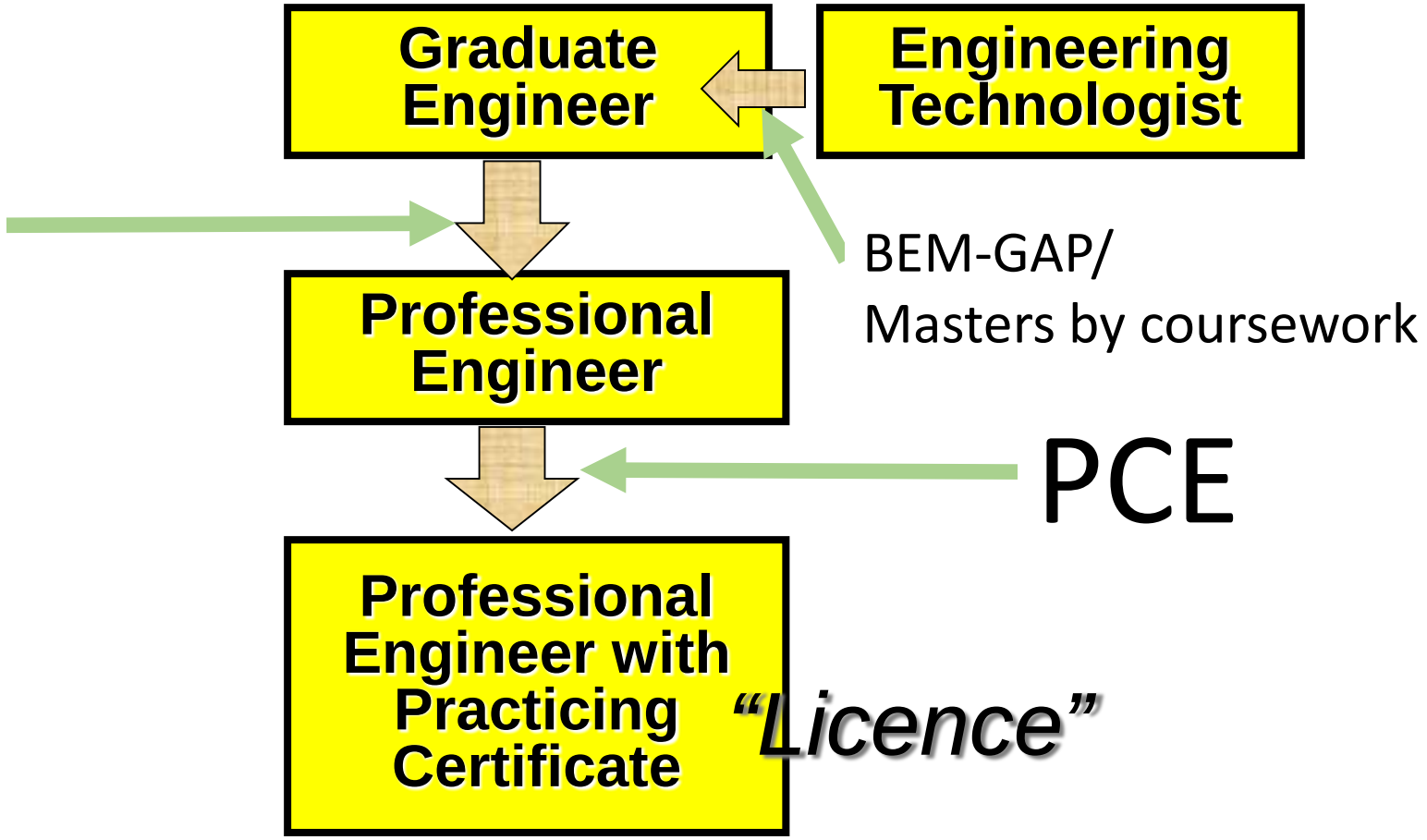
PROFESSIONAL PATHWAY

Three Routes to become a Professional Engineer

B International Route

C IEM Route PI

A BEM Route **Professional Assessment Examination** (PAE)



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IN THE CONTEXT OF THE NEW "2-TIER" LANDSCAPE, THERE IS DIFFERENCE IN FOCUS BETWEEN ASSESSMENTS FOR P.E. & P.E.P.C.

PE : THE PROFESSIONAL ASSESSMENT EXAMINATION (PAE) in a nutshell:

"…tests a candidate on what he "knows" from his area of training & experience, and NOT from areas he did not go through."

PEPC: THE PROFESSIONAL COMPETENCY EXAMINATION (PCE)

In a nutshell…

"…tests a candidate on what he ought to know".

2.
WHO NEEDS TO BECOME A PEPC?

(Do you really need to be a PEPC?)

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PE & PEPC : "Two-tier registration" system

- Previously (prior to 2015 Amendments), a PE is entitled to submit plans & documents
  - Now the PEPC takes up this role.
- A PE who is not intending to be 'submitting person' need not become a PEPC.
  - …he/she just needs to pass the PAE;
- only the PEPC needs to sit for the PCE.
  - but the PE can still retain their professional status and the title of "Ir." .

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Reasons

- **Approx. 80% of all Professional Engineers (P.Eng.) are registered under Civil, Mechanical & Electrical.**
- **Only a small fraction of this 80% (estimated at 3,000 to 4,000) are 'practicing' or wish to be the 'Submitting Person'.**
  (Note that Engineers registered with BEM are >170,000)
- **The rest are employed in Contracting, Factories, Engineering Plants, Maintenance, Employees of Consultants, Government, Academia, Sales, etc.**

THE SUBMITTING PERSON

Street, Drainage and Building Act 1974 (Act 133)
Part I, 3. Interpretation

"submitting person" → means a qualified person who submits plans other than building plans to the local authority or relevant statutory authority in accordance with this Act or any by-laws made thereunder and includes any other qualified person who takes over the duties and responsibilities of or acts for the first mentioned qualified person;

With the amendments the "principal submitting person", "qualified person" or "submitting person" shall only mean "professional engineers with a practising certificate in force" which have the entitlement as stated in the Engineers Act.
Submitting Persons should take note.

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Hence only a PEPC can be a Submitting Person

Section 8(1). - New section

Except as otherwise provided under any other written law, no person or body, other than a PEPC who is residing and practising in Malaysia or an ECP providing professional engineering services in Malaysia, shall be entitled to submit plans, engineering surveys, drawings, schemes, proposals, reports, designs or studies to any person or authority in Malaysia.

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But, the Professional Engineer still has a submitting role

Section 8A. - New section

Subject to this Act, any person who is a Professional Engineer shall be entitled to submit plans or drawings where such plans or drawings are in connection with equipment, plant or specialised product invented or sold by him or his employer.

For the purpose of this section the expression "employer" shall not include a client.

SHAREHOLDING & DIRECTORSHIP REGULATIONS HAVE BEEN LIBERALISED

- Any person can be a shareholder of an ECP registered with BEM, even up to 100%
- Any person can be a director in a body corporate registered as an ECP with BEM,
  up to a maximum of 1/3 of Board members
    i.e. PEPCs must constitute at least 2/3 of Board members.

3.
SO, WHO NEEDS TO SIT FOR THE PCE?

YOU NEED TO SIT FOR THE PCE (TO BECOME A PEPC), ONLY IF……..

- You want to have the “license” to be a submitting person as per Section 8(1) of the REA.

OR

- You want to be a partner in a partnership firm registered as an ECP with BEM.

OR

- You want to set up a Sole Proprietorship, or a single-director body corporate, and register as an ECP with BEM.

OR

- You want to control the day-to-day affairs of the body corporate registered as an ECP with BEM (as per REA Section 7A(3)(c)(iv))

IF YOU ARE ALREADY A PE

YOU CAN DO THE FOLLOWING:-

- Submit documents **only for** specialised engineering products, equipment, etc invented or sold by you as per Section 8A of the REA.
- Be a shareholder in a body corporate registered as an ECP with BEM.
- Be a director in a body corporate registered as an ECP with BEM, provided your appointment does not cause the PEPCs in the Board to constitute less than 2/3 of Board members.
- Be an employee in an ECP registered with BEM

SO, DO YOU STILL NEED TO SIT FOR THE PCE?

4.
ABOUT THE
PCE

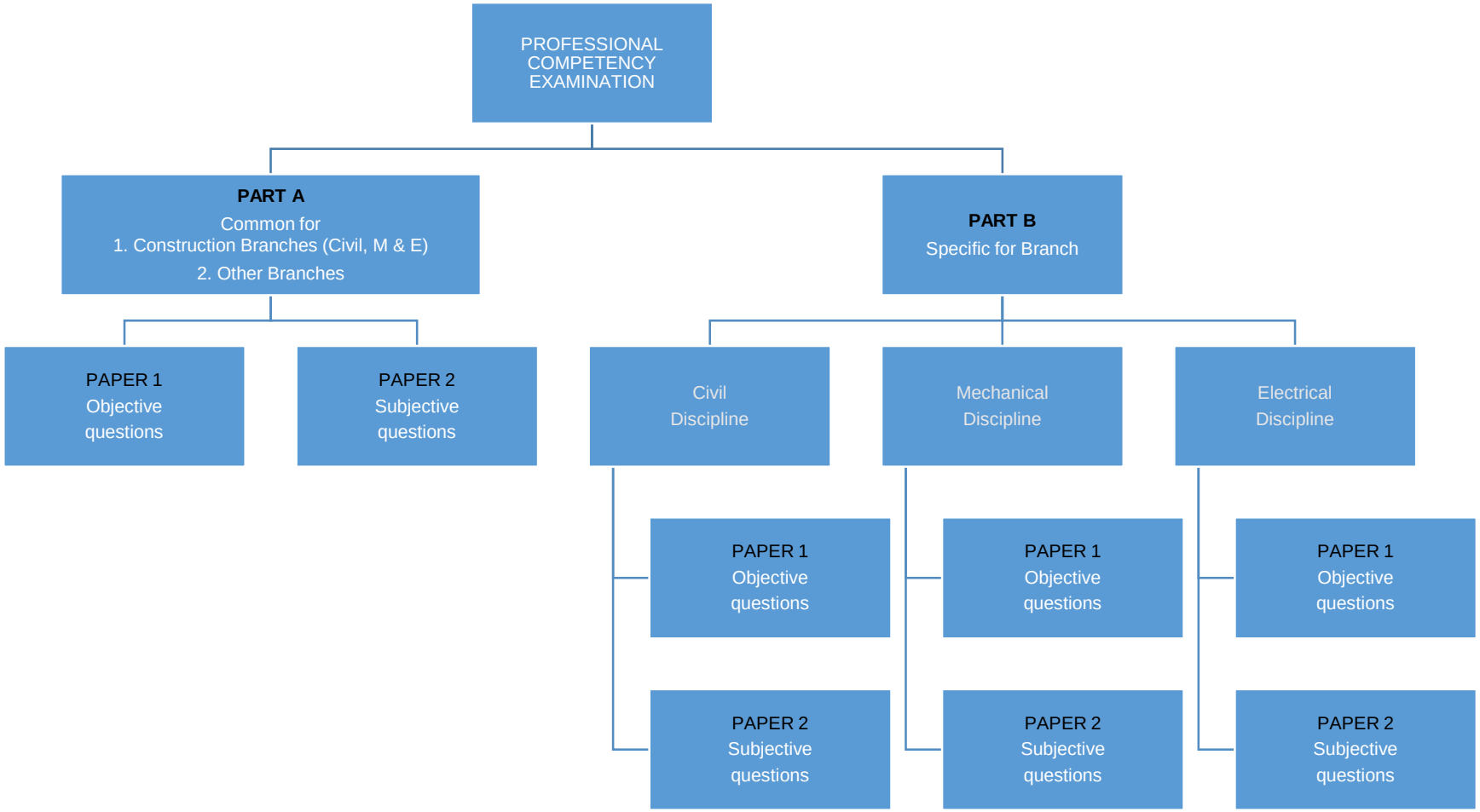
All you need to know

SCOPE OF THE PCE

The PCE will test the candidates within the limits of "**professional engineering services**" as defined by the Act, i.e. on 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
- ✓**Technical knowledge** necessary for practice in that branch of engineering

SUMMARY OF THE EXAMINATION SYSTEM



APPLICATION TO SIT FOR THE PCE…

- Eligible candidates for the PCE must be a Professional Engineer registered with the Board in the appropriate branch / discipline
- Apply to BEM by completing a prescribed form at (www.engineer.org.my), and pay the prescribed fees
- On approval of the candidate's application by the Board, the candidate is allowed to sit for the examination

PCE COMPRISES OF PART A & PART B

REGULATIONS FOR THE PCE

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

BRANCHES FOR PCE

Currently:

- Construction branches: Civil/Mechanical/Electrical
- Non-Construction branches – Chemical/Geotechnical/Mining/Environmental

Candidates who want to sit for other branches of practice need to write to the Board of Engineers Malaysia (BEM) to prepare PCE for these other branches of practice

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OPEN BOOK EXAM !

You can bring any document/book/report, except loose paper.

Any loose documents must be bound

Fees

- RM1000 + RM100(non-refundable)
- Resit – RM500 + RM100(non-refundable)

Results after 4 months

Typical 2-day Programme

DAY 1 *(17th Oct 2023)*

Time	Programme
7.00 am – 8.50 am	Registration
9.00 am - 10.30 am	Common / Non-Construction (Paper 1)
10.30 am - 11.15 am	Break
11.15 am – 1.30 pm	Common / Non-Construction (Paper 2)

DAY 2*(17th Oct 2023)*

Time	Programme
7.00 am – 8.50 am	Registration
9.00 am - 10.30 am	Paper 1: Civil/Mechanical/Electrical/Chemical/Geotechnical/Mining/Environmental
10.30 am - 11.15 am	Break
11.15 am – 1.30 pm	Paper 2: Civil/Mechanical/Electrical/Chemical/Geotechnical/Mining/Environmental

PCE PART A – COMMON PAPER

* 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.

- Paper 1 (MCQ) – 1.5 hrs
- Paper 2 (Subjective) - 2 hrs (plus 15 minute reading prior)

- Candidates must pass both papers at one sitting.

PCE PART B – TECHNICAL PAPER

* Technical in nature

* Different for each branch

* Tests candidate's competency within his respective field of practice on :
  - Regulations and rules of practice by BEM
  - Statutory laws, design standards, regulations, etc.

❖ Paper 1 (MCQ) – 1.5.hours, and

❖ Paper 2 (Subjective) -2 hours (plus 15 minute reading prior)

❖Candidates must pass both papers at one sitting.

FORMAT OF THE PCE

PART A		TIME ALLOCATED	FORMAT
Common Paper	Paper 1	1.5 hours	40 objective questions. Passing mark 50%
	Paper 2	2 hours (plus 15 min. reading prior)	Answer 3 out of 5 subjective questions. Passing mark 50%
PART B		TIME ALLOCATED	FORMAT
Technical Paper	Paper 1	1.5 hours	40 objective questions. Passing mark 50%
	Paper 2	2 hours (plus 15 min. reading prior)	Answer 3 out of 5 subjective questions. Passing mark 50%

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Examiners/Markers for Paper 2 (Subjective)

Applicable for both Part A and Part B

- Each Candidate's answer script will be independently marked by two 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.

PCE TIPS for Subjective Questions in Paper 2 for both Parts A & B

The Do's & Don'ts when answering the Questions

a) The Questions are set as "THINKING Questions" to test your readiness to perform as a PEPC. Hence, **DO** read the question carefully and answer to the point.

b) **DON'T** 'cut and paste' wholesale from an open book, document or workshop manual. You can easily miss answering the question completely or even fail to answer the question at all!

c) Weightage for each sub-question is indicated to guide you on time allocation you should spend on. Hence **DON'T** beat round the bush in your answer as no extra marks will be given.

d) As a general guide, each question should be adequately answered within one A4 page or at most 1 ½ page.

PCE TIPS

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 120 mins - 40 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.

The PCE is being continuously reviewed for improvement purposes

Appendix:
PCE Syllabus
&
Sample Questions

For Construction Papers Civil, Mechanical & Electrical Branches

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Q & A

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THANK YOU

"Committed To Engineering Excellence"

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Appendix:
PCE Syllabus
&
Sample Questions

For Construction Papers Civil, Mechanical & Electrical Branches

Common Paper
(Civil, Mechanical & Electrical)

PART A – Construction Common Papers 1 & 2 (Civil, Mechanical & Electrical)

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.

Syllabus For Common Paper: Civil, Mechanical, & Electrical

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

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- Technical Paper

(Civil, Mechanical & Electrical)

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 m^2

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 m^2

D. Over 18.5 m and 1,000 m^2

E. Over 30.5 m and 1,000 m^2

[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 1500m^2 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.

a) Office occupants seating next to window complain of unsatisfactory air conditioning. Your on-site measurement shows the design temperature of 24^0C DB and 55% RH is achieved.

b) Hotel guests complain it takes a long time to get hot water from their toilet showers and the water temperature fluctuates during their showers.

c) 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 – Civil Paper 1 (MCQ) & 2 (Essay)

Category	Weightage
Geotechnical	Approximately 20%
Infra-structural	Approximately 40%
Structural	Approximately 40%
Regulations, submission and Contract administration	In Part A

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

What To Prepare & How To Prepare – Format Of The Exam

- Paper 1 – 40 MCQ – Need to answer all
  – 1 ½ hours duration

- Paper 2 – 5 essay questions – Need to answer 3
  – 1 ½ hours duration

What To Prepare & How To Prepare – What Do You Need To Know?

Geotechnical Works

Generally including but not limited to:

- Soil investigation for earthworks, footings and piled foundations and basements
- General knowledge of different soil and rock formations
- Types of laboratory tests for earthworks and foundation
- Interpretation of test results
- Retaining wall, pile and footing design

What To Prepare & How To Prepare – What Do You Need To Know?

Earthworks

Generally including but not limited to:

- 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

What To Prepare & How To Prepare – What Do You Need To Know?

Structures

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

What To Prepare & How To Prepare – What Do You Need To Know?

Water and Sewerage

- Acts and design guidelines
- Water, reticulation design and sewerage system design
- Net work analysis, hydraulic calculations
- Master planning requirements

What To Prepare & How To Prepare – What Do You Need To Know?

Road and Drainage

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

What To Prepare & How To Prepare – What Do You Need To Know?

- Exam is practice oriented
- Questions relates to practical matters commonly encountered in work
- Time constraints? Exam is open book!
- Sufficient time to refer but not enough time to search
- Sufficient time to check but not enough time to learn
- Subject matter covered by syllabus
- In design work, major sub-disciplines such as civil infrastructure, geotechnical and structures are inter-related
- Candidate need to understand and be conversant with basic Civil Engineering design matters for all major sub-disciplines

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 ½ 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 – 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]

Paper 2 (Subjective)
Part A - **Common Paper**
Sample Questions

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 A: Common Paper 2 – PAST YEAR QUESTION
CASE EXAMPLE elaborating the DO's & DON'Ts

Q3. PEPC X is appointed by Owner Z based on the BEM Model Form of Agreement. By the time construction has begun, Z has persistently defaulted on paying fees to X despite repeated requests for timely payment in accordance with the Consultancy Agreement.

X decides to terminate his services while construction is still on-going.

How should X go about doing so properly and also without risking being counter-sued by Z for causing delay and losses to the project?

(100 marks)

[Common Law - Local Acts, Local Authority; Construction Contract Law and ECP Business & Management]

PART A: Common Paper 2 – PAST YEAR QUESTION
CASE EXAMPLE elaborating the DO's & DON'Ts

Q3. PEPC X is appointed by Owner Z based on the BEM Model Form of Agreement. By the time construction has begun, Z has persistently defaulted on paying fees to X despite repeated requests for timely payment in accordance with the Consultancy Agreement.

(BACKGROUND OF THE QUESTION)

X decides to terminate his services while construction is still on-going.

(ACTION LEADING TO THE QUESTION)

How should X go about doing so properly and also without risking being counter-sued by Z for causing delay and losses to the project?

(THE QUESTION PROPER TO BE ANSWERED)

PART A: Common Paper 2 – PAST YEAR QUESTION
CASE EXAMPLE elaborating the DO's & DON'Ts

Q3. PEPC X is appointed by Owner Z based on the **BEM Model Form of Agreement**. By the time construction has begun, Z has persistently defaulted on paying fees to X despite repeated requests for timely payment in accordance with the Consultancy Agreement.

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(THE QUESTION PROPER TO BE ANSWERED)

PART A: Common Paper 2 – PAST YEAR QUESTION

CASE EXAMPLE elaborating the DO's & DON'Ts

Q3. PEPC X is appointed by Owner Z based on the **BEM Model Form of Agreement**. By the time construction has begun, Z has persistently defaulted on paying fees to X despite repeated requests for timely payment in accordance with the Consultancy Agreement.

A1: BEM Model Form of Agreement item 2.9 states that the consultant shall promptly notify the client in writing …… submitted to arbitration in accordance with clause 4.1.

Under REA Scale of Fees for payment following termination by the consulting engineer……..

Under BEM Form of Agreement item 11.6, all sums due from client …. 42 days….. 2% per annum interest rate……

DON'T REPRODUCE WHOLESALE WITHOUT ANSWERING THE QUESTION DIRECTLY!!!

PART A: Common Paper 2 – PAST YEAR QUESTION

CASE EXAMPLE elaborating the DO's & DON'Ts

Q3. X decides to terminate his services while construction is still on-going.

How should X go about doing so properly and also without risking being counter-sued by Z for causing delay and losses to the project?

A2: X should claim through CIPA Act. If payment is not received, need not issue LOR.

X can also engage BEM as stakeholder for the payment issue with regards to LOR issuance.

DON'T ANSWER OUT OF CONTEXT – LOR IS NOT AN ISSUE HERE!

PART A: Common Paper 2 – PAST YEAR QUESTION

CASE EXAMPLE elaborating the DO's & DON'Ts

Q3. X decides to terminate his services while construction is still on-going.

How should X go about doing so properly and also without risking being counter-sued by Z for causing delay and losses to the project?

A3: X shall initiate adjudication proceedings under CIPAA.

X shall within 10 working days ….. serve a written adjudication claim … on Z.

Under clause 29(i) of CIPAA, …….

On the other hand, X might serve a letter to BEM to seek for their advice……

Refer clause 3.5, X to inform LA that he is withdrawing from the project.

DON'T EXTRACT & COPY WHOLESALE WITHOUT ANSWERING THE QUESTIONS!

PART A: Common Paper 2 – PAST YEAR QUESTION
CASE EXAMPLE elaborating the DO's & DON'Ts

Q3. X decides to **terminate his services** while **construction is still on-going**.

How should X go about **doing so properly** and also without risking being **counter-sued by Z for causing delay and losses to the project**?

A: **DO ANSWER THE ABOVE HIGHLIGHTED ISSUES DIRECTLY**

[Common Law - Local Acts, Local Authority; Construction Contract Law and ECP Business & Management]

TECHNICAL

PAPER 2

Paper 2 (Subjective)

(Civil, Mechanical & Electrical)

MECHANICAL PAPER 2

PART B – Mechanical Paper 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
- 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, pumping and distribution
- Hot water generation and circulation
- Sanitary and waste plumbingand sewage pumps
- 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: 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 1500m^2 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.

a) Office occupants seating next to window complain of unsatisfactory air conditioning. Your on-site measurement shows the design temperature of 24^0C DB and 55% RH is achieved.

b) Hotel guests complain it takes a long time to get hot water from their toilet showers and the water temperature fluctuates during their showers.

c) 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: Mechanical Paper 2 – PAST YEAR QUESTION
CASE EXAMPLE elaborating the DO's & DON'Ts

- Q3. A completed 500-room city hotel is installed with 3 nos. of 800 RT water-cooled centrifugal chillers. During actual operation, the normal peak cooling load is 1,000 RT while the night load averaged 400 RT.
  a) Discuss the consequence of this chiller configuration.
  b) What would be your most economical solution to improve on the operating performance of the chiller plant if the owner has capex only for one chiller replacement but not any associated equipment? Explain the merits of your decision. Note that there is no plantroom space to house an additional smaller chiller.
  c) If you were to design a similar hotel in future, what would be your chiller configuration and why?

[ACMV]

PART B: Mechanical Paper 2 – PAST YEAR QUESTION
CASE EXAMPLE elaborating the DO's & DON'Ts

- Q3. A completed 500-room city hotel is installed with 3 nos. of 800 RT water-cooled centrifugal chillers. During actual operation, the normal peak cooling load is 1,000 RT while the night load averaged 400 RT.

(IDENTIFY THE FACTS GIVEN)

PART B: Mechanical Paper 2 – PAST YEAR QUESTION
CASE EXAMPLE elaborating the DO's & DON'Ts

- Q3. A completed 500-room city hotel is installed with 3 nos. of 800 RT water-cooled centrifugal chillers. During actual operation, the normal peak cooling load is 1,000 RT while the night load averaged 400 RT.

a) Discuss the consequence of this chiller configuration.

(UNDERSTAND THE QUESTION AND ANSWER TO THE POINT)

With the existing configuration, explain the deficiencies faced during operation and why.

(20 marks)

PART B: Mechanical Paper 2 – PAST YEAR QUESTION
CASE EXAMPLE elaborating the DO's & DON'Ts

- Q3. A completed 500-room city hotel is installed with 3 nos. of 800 RT water-cooled centrifugal chillers. During actual operation, the normal peak cooling load is 1,000 RT while the night load averaged 400 RT.

b) What would be your most economical solution to improve on the operating performance of the chiller plant if the owner has capex only for one chiller replacement but not any associated equipment? Explain the merits of your decision. Note that there is no plantroom space to house an additional smaller chiller.

(PROPOSE YOUR SOLUTION AND WHY)

Describe what you would change to achieve better efficiency bearing in mind the constraints and why it is better.

(50 marks)

PART B: Mechanical Paper 2 – PAST YEAR QUESTION
CASE EXAMPLE elaborating the DO's & DON'Ts

- Q3. A completed 500-room city hotel is installed with 3 nos. of 800 RT water-cooled centrifugal chillers. During actual operation, the normal peak cooling load is 1,000 RT while the night load averaged 400 RT.

c) If you were to design a similar hotel in future, what would be your chiller configuration and why?

(PROPOSE THE MOST OPTIMUM SOLUTION)

Explain what is your optimum design and also explain why.

(30 marks)

CIVIL PAPER 2

PART B – Civil Paper 1 (MCQ) & 2 (Essay)

Category	Weightage
Geotechnical	20%
Infra-structure	40%
Structural	40%
Regulations, submission and Contract administration	In Part A

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

WHAT TO PREPARE & HOW TO PREPARE

- Format of the exam – 20th September 2022
- What do you need to know? – 20th September 2022
- Sample Questions – 20th September 2022

- How much will you need to know? - 26th September 2022
- What do you need to bring along? - 26th September 2022
- Tips and strategies - 26th September 2022
- Actual Questions – 26th September 2022

“ If you know your enemy and know yourself, you need not fear the results of a hundred battles”

-Sun Tzu, Art of war

What To Prepare & How To Prepare – Know Your Enemy

- Not like university exam
- The syllabus is wide
- PCE mimics work environment. Open book
- Difficult but largely unnecessary to study
- Understand what and why you do
- Be familiar with your handbooks and texts
- Know where to find things
- No time to search from scratch, only time to refer
- Calculations not heavy duty but easy, straightforward to demonstrate understanding
- Level of difficulty is similar to hand check or preliminary sizing/design

What To Prepare & How To Prepare –
Know Your Friends / Know Yourself

What do examiners expects from you?

- Know what to expect from examiners. Know what the examiners expect from you.
- "PEPC should not endorse plans for design that he/she is not familiar with".
- Engineer must know what he is doing and know what he does not know. How?
- Reached a level a competency to have sufficient understanding of the major sub-disciplines of Civil Engineering and to know his/hers limitation and to realise things he does not know. Allowed to sign for all and so need to know all.
- Demonstrate an understanding of design processes.
- Multi-disciplinary understanding required e.g. soil~structure interaction.
- Marking liberal. Examiners mindful that multiple correct answers.
- No single correct answer but multiple correct solutions.
- Need to convince examiners that you know and understand.

What To Prepare & How To Prepare –
What Do You Need To Bring Along?

- Calculator (non-programmable), writing implements, ruler
- Design codes and guidelines
- Reference books, design handbooks, design guides, charts and tables
- Answer spans many parts of a book. Need to be familiar otherwise not enough time to search
- i.e. all the things you normally use at work – except computer

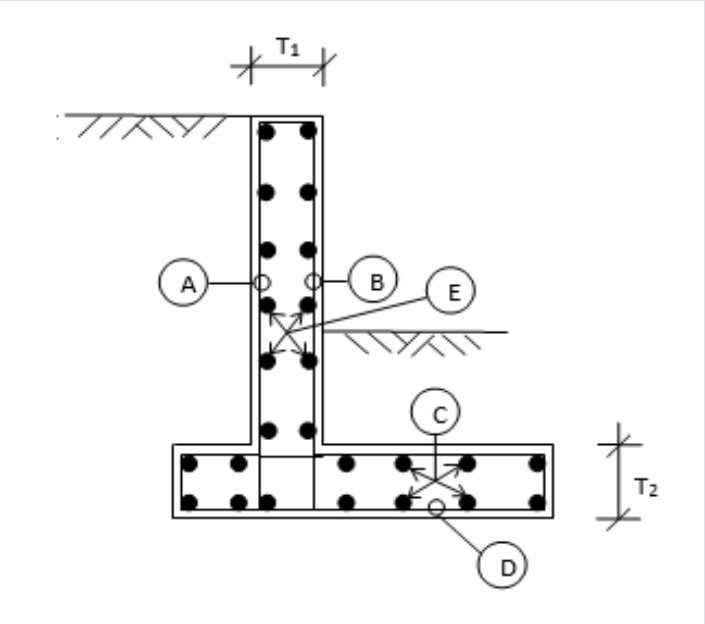
What To Prepare & How To Prepare –
Tips and Strategies

- MCQ questions range from easy to moderate to hard. Approximately 40%, 40% and 20%
- Essay questions will have parts ranging from easy to hard
- Limited time so tackle easy part first
- Don’t leave questions or parts of questions unanswered
- Look at the marks allocated and apportion time spend appropriately.
- Passing marks is 50%. Both Papers 1 and 2 must achieve at least 50% each to pass.

What To Prepare & How To Prepare – Tips and Strategies (Cont'd)

- Answers should preferably be made using black ink
- Answers in both English and Bahasa Melayu are acceptable
- Answer in answer booklet only. DO NOT write in question booklet

PART B: Civil Paper 1 – ACTUAL QUESTION

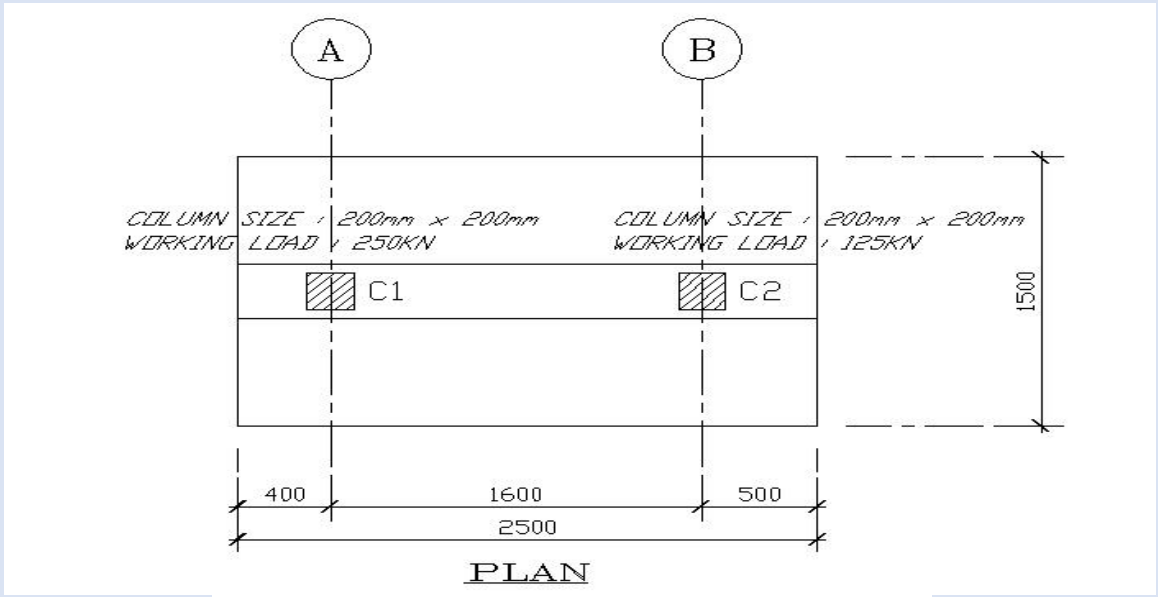


In the above section of a retaining wall, where $T_2 > T_1$, the reinforcement bars are labelled A to E. If the yield stresses and cover for all the bars are identical, which of the bars have the highest area A_{st}/m width?

A. A
B. B
C. C
D. D
E. E

C79 OF 15(26th September 2022)

PART B: Civil Paper 2 – ACTUAL QUESTION



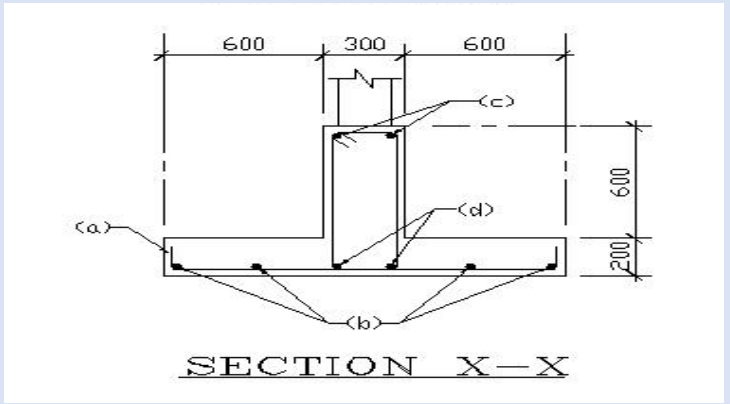


FIGURE 1

C80 OF 15(26th September 2022)

PART B: Civil Paper 2 – ACTUAL QUESTION -(Cont'd)

Figure 1 shows the plan, elevation and cross-section of a combined footing supporting two (2) columns C1 and C2 at gridlines A and B .

The working loads of the columns C1 and C2 are 250 kN and 125 kN respectively.

i. Calculate the bearing pressure imposed by the footing on the ground and show clearly how the bearing pressure varies and state the maximum and minimum values. (35 marks)

Ans: ***Self weight*** $= [(2.5m \times 1.5m \times 0.2m) + (2.5m \times 0.3m \times 0.6m)] \times 24\ kN/m^3$

$= 28.8\ kN$

Sum of load ΣN $= 250\ kN + 125\ kN + 28.8\ kN = 403.8\ kN$

Moment of load about a-a $= 250 \times 0.4 + 125 \times 2.0 + 28.8 \times 1.25\ kNm = 386\ kN$

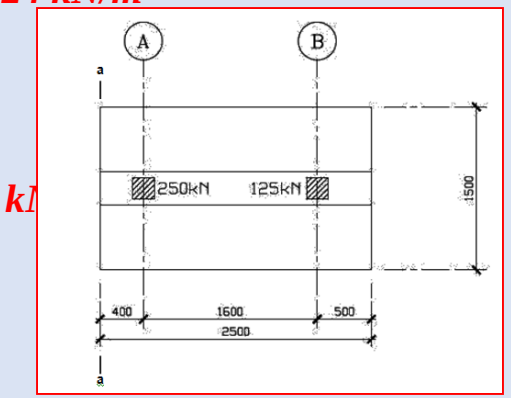
CG from a-a $\dfrac{386\ kNm}{403.8\ kN}$

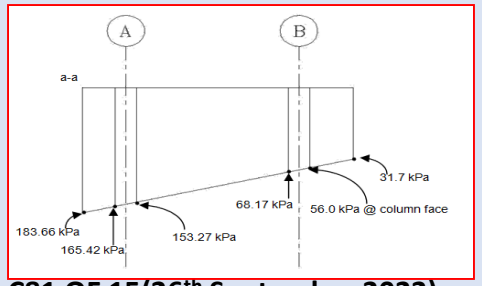
$= 0.956m$

Bearing pressure $\sum = \dfrac{N}{A} \pm \dfrac{M}{Z}$

$= 107.68\ kPa \pm 75.98\ kPa$

$= 183.66 / 31.7\ kPa$





PART B: Civil Paper 2 – ACTUAL QUESTION -(Cont'd)

ii. Calculate the ultimate bending moments that should be used to design the reinforcement marked (a) and (b) in the cross-section X-X. (5 marks)

Ans:

Maximum ultimate slab transverse cantilever moments =

$$M_u = 1.5 \times 183.66\ kPa \times \frac{0.6m^2}{2}\ kNm/m$$

$$= 49.6\ kNm/m$$

A_{st} *(transverse)* $= 546\ mm^2/m$

A_{st} *(longitudinal)* $= 0.13\%\ bd$

$$= \frac{0.13}{100} \times 1000 \times 250$$

$$= 325\ mm^2/m$$

PART B: Civil Paper 2 – ACTUAL QUESTION -(Cont'd)

iii. Using the bearing pressures obtained in (i) above, sketch the bending moment diaphragm (BMD) for the footing beam in the longitudinal direction.

Draw the bending moment on the tension side and <u>estimate</u> the magnitude of the moments.

(30 marks)

Ans:

Cantilever slab moments at column C1

$M_D = 1.5 \times (183.66\ kPa \times 1.5m) \times \frac{0.3^2}{2}\ m^2$

$= 18.6\ kNm$

Cantilever moments at column C2

$M_D = 1.5 \times (56.0\ kPa \times 1.5m) \times \frac{0.4^2}{2}\ m^2$

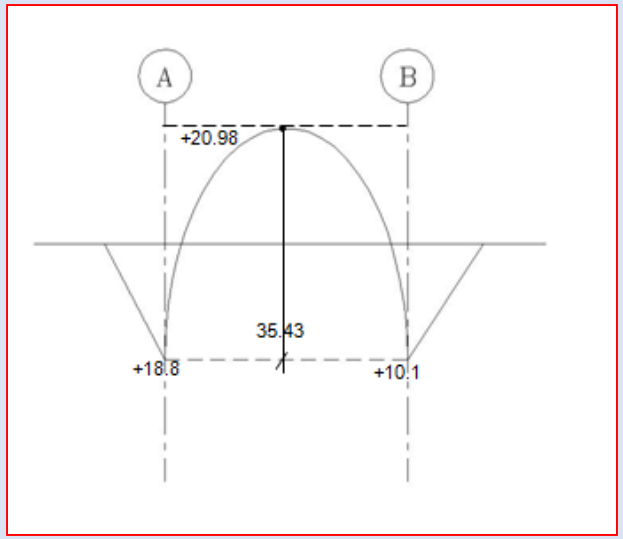
$= 10.1\ kNm$

Between columns, $w = \frac{1.2}{2}(153.27 + 68.17)$

$= 110.72\ kN/m$

$\frac{wl^2}{8} = \frac{110.72 \times 1.6^2}{8}$

$= 35.43$

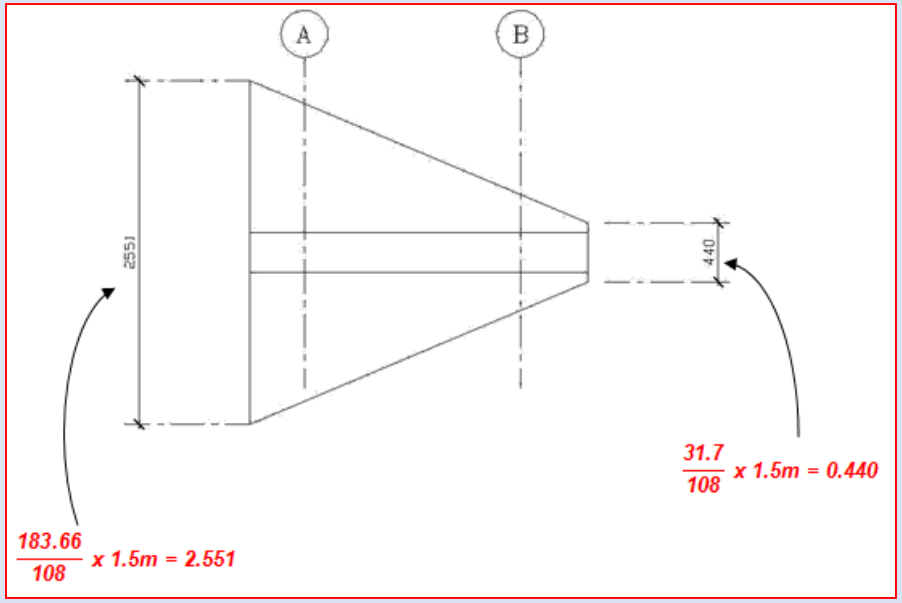


PART B: Civil Paper 2 – ACTUAL QUESTION -(Cont'd)

iv) If the maximum allowable bearing pressure was determined to be 108 kPa, does the maximum applied footing bearing pressure exceed this?

If it does, suggest two (2) ways to reduce the applied bearing pressure to be within the allowable bearing pressure without increasing the plan area of the footing. (30 marks)

Ans: ***(a) Vary the width of footing***



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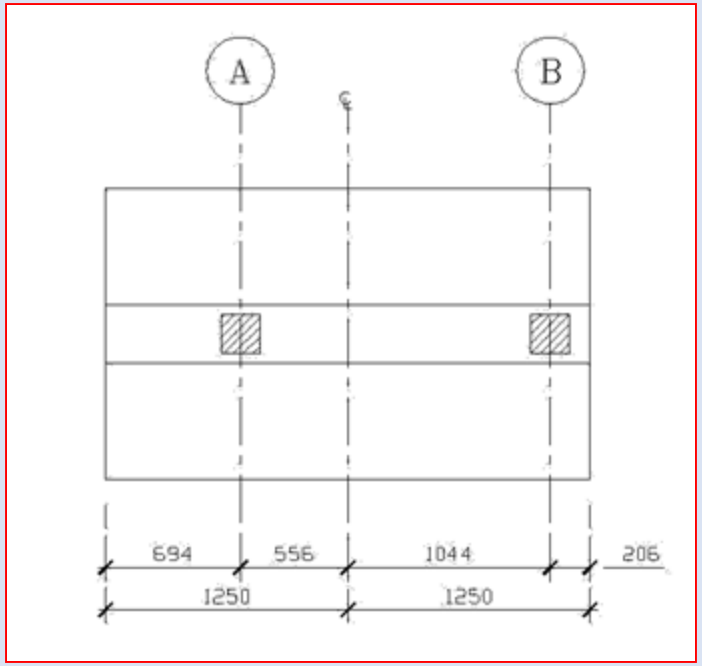
PART B: Civil Paper 2 – ACTUAL QUESTION -(Cont'd)

iv) If the maximum allowable bearing pressure was determined to be 108 kPa, does the maximum applied footing bearing pressure exceed this?

If it does, suggest two (2) ways to reduce the applied bearing pressure to be within the allowable bearing pressure without increasing the plan area of the footing. (30 marks)

Ans: ***(b) Shift footing centre to load centre***



C85 OF 15(26th September 2022)

ELECTRICAL PAPER 2

Electrical Paper 2 Expectations

- What are some of the expectations that the examiners have for those taking the Professional Competency exams?

1. Being familiar with all the regulatory requirements in this country if you want to practice here. The Court will not accept such excuses given that you only work in a silo environment and you are not aware of certain laws.
2. You must be competent in all areas of your discipline including high voltage, transmission and generation or even high rise. Once you are given the competency licence, you are allowed to do design for all areas. There is no such thing for a PEPC given with restriction to only low voltage installations.
3. Technical competency is also very important as people can get electrocuted, electrical installations being terribly over-designed leading to wastages, electrical equipment not adequately protected by relays which may cause the equipment to explode and killing people standing nearby.

Electrical Paper 2 Expectations

- You are expected to learn from others in areas that you have no working experience. Be pro-active to ask questions on other areas you are not competent in and especially on understanding the reasons behind why things are done in a certain way.
- Our questions will test you on your conceptual understanding and if it is completely wrong, you may even get zero mark. Of course, if you get the concepts all correct you may even get 100% marks. Those not answering to the question will certainly get zero mark.
- Let me share with you a past year exam question which was used twice as the examination question. The historical passing rate for this question was very low if not the lowest for all questions. I have decided to share this question as the concepts are very fundamental to electrical safety to both personnel and equipment which every competent electrical engineer must know. I gladly sacrifice this question in order to educate the electrical engineering community.

The question

A. Explain the concept of Equipotential Bonding / Earthing. (20 marks)

B. How does this concept apply in protecting people and equipment? (20 marks)

C. How is this concept applied in designing extra high voltage substation grounding? (20 marks)

D. How is this concept applied in protecting people in buildings against lightning strikes? (20 marks)

E. What are the issues arising from equipotential earthing method affecting telecommunication / computer earthing at a building? How do you mitigate such issues? (20 marks)

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]

THANK YOU

"Committed To Engineering Excellence"

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