



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2016/2017**

**COURSE NAME : ELECTRICAL SYSTEMS DESIGN**  
**COURSE CODE : BEF 45303**  
**PROGRAMME CODE : BEV**  
**EXAMINATION DATE : JUNE 2017**  
**DURATION : 3 HOURS**  
**INSTRUCTION : ANSWER ALL QUESTIONS**

**TERBUKA**

**THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES**

- Q1** (a) Interpret the total connected load (TCL), diversity factor (DF), and maximum demand (MD) commonly used in electrical system design. (6 marks)
- (b) Outline **six (6)** general criteria in determining design requirements of either single phase or three phase electricity supply system. (6 marks)
- (c) Compare **six (6)** advantages of T5 type fluorescent lamp with conventional T8 type standard lamp. (6 marks)
- (d) Justify typical capacity ratings of 1000kVA transformer allowable in designing TNB substation. (2 marks)
- Q2** (a) Explain briefly the definition of illuminance, footcandles and luminance. (6 marks)
- (b) A standard 2 x 38 W compact fluorescent luminaire is to be fitted into the ceiling of an office with length, width and ceiling height of 20 ft, 14 ft and 12 ft, respectively. With luminous efficacy of 45 lumen/W, the lens of the lamp is to be securely locks to base with spring-loaded tabs with base mounts to 2 ft x 4 ft ceiling boxes. The wall and ceiling reflecting surfaces are white color with utilization and maintenance factors of 0.45 and 0.83, respectively.
- (i) Analyse the number of lamps required using MS 1525:2014 Interior Lighting System Standard of 300 lux for general office. (4 marks)
- (ii) Conclude the findings with **four (4)** possible factors that influences the number of lights. (4 marks)
- (iii) Design the proposed interior lighting system using JKR Technical Guide of Lighting based on normal ceiling boxes. (6 marks)

- Q3** (a) List **five (5)** main components of lightning protection system commonly used in residential system. (5 marks)
- (b) Design an ideal scenario of lightning protection system of **Figure Q3(b)** according to latest edition of IEC 62305 Part 1 to 4. (15 marks)
- Q4** (a) Design a complete electrical system of double chamber sub-station in **Figure Q4(a)** by using all items in **Table Q4(a)**. Use appropriate symbol for all lighting, switch socket outlet (SSO), switch and distribution board (DB) according to TNB Substation Design Standard. (15 marks)
- (b) Develop a single line diagram of electrical system designed in **Q4(a)**. (5 marks)
- Q5** (a) An electrical engineer is given a task to design electrical system of a new development as follows:
- “Cadangan Pembangunan 2 Blok Pangsapuri Yang Mengandungi;
- (i) Blok A 20 Tingkat (200 Unit Rumah)
  - (ii) Blok B 15 Tingkat (150 Unit Rumah)
  - (iii) 1 Unit Stesen Suis TNB 11kV
  - (iv) 1 Unit Rumah Sampah
  - (v) 1 Unit Pondok Pengawal
- Di Atas Sebahagian PTD 101, Mukim Parit Raja, Daerah Batu Pahat, Johor Darul Ta'zim Untuk Tetuan UTHM Sdn Bhd”
- (i) Analyse the total connected load (TCL) and maximum demand (MD) of one unit house based on the proposed electrical equipment listed in **Table Q5(a)**. Use diversity factor (DF) of 0.4, 0.6 and 0.8 for small power utility, high power equipment and TCL, respectively. (8 marks)
- (ii) Evaluate the maximum demand (MD) for all houses in Blok A and Blok B using diversity factor (DF) of 0.8. (3 marks)

- (iii) Examine the common area maximum demand for all blocks including M&E circulation in five level basement parking of Blok A, three level basement parking of Blok B and both roof floors using the followings:

Common area : 550m<sup>2</sup>

Lighting PD : 5W/m<sup>2</sup> with 0.8 DF

Small PD : 10W/m<sup>2</sup> with 0.4 DF (at basement & roof only)

(5 marks)

- (b) Propose a suitable intake of electric power supply for the whole development. Use TNB Electricity Supply Application Handbook (ESAH) guidelines based on total maximum demand.

(4 marks)

– END OF QUESTIONS –



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**Figure Q3(b)**

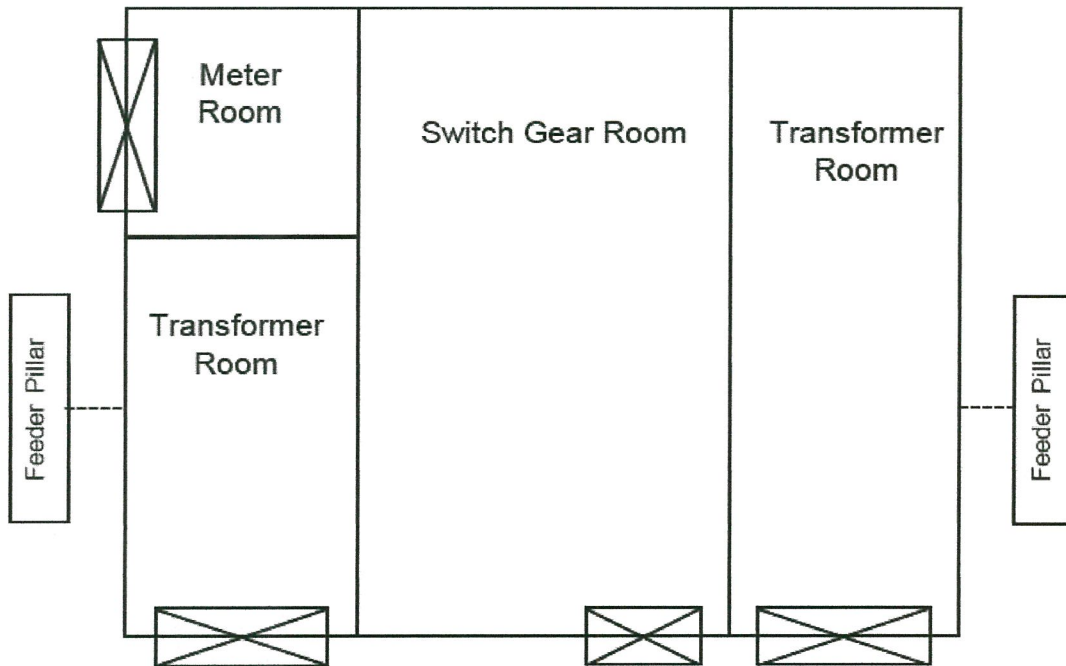
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**Figure Q4(a)**

**Table Q4(a)**

No	Items	Quantity
1	1 x 18W Incandescent Light Bulb	10
2	1 x 18W Incandescent Light Bulbs c/w Weather Proof Light Fitting, Photoelectric Control Unit (PECU) and 50A contactor	8
3	Emergency Light (2 x 13W Econlite SIRIM Approved)	3
4	13A Metal Clad SSO (5ft above FL)	4
5	5A Metal Clad One Way Switch	4
6	30A Single Phase Distribution Board	1
<b>Total (Nos)</b>		<b>30</b>

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Table Q5(a)

No	Description	Light point (36W)	13A SSO (220W)	Fan point (60W)	15A Heater (3kW)	20A A/C (2HP)
1	Master bedroom	2	2	1		
2	Bedroom 1	1	1	1		
3	Bedroom 2	1	1	1		
4	Toilet MBA	1			1	
5	Toilet B1	1				
6	Living	2	2	1		1
7	Dining	1	1			
8	Kitchen	1	2			
9	Service Yard	1	1			
10	Entrance	1				