



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014**

COURSE NAME : ELECTRICAL POWER SYSTEM
COURSE CODE : DAE 32403
PROGRAMME : 3 DAE
EXAMINATION DATE : DECEMBER 2013/JANUARY 2014
DURATION : 2½ HOURS
INSTRUCTIONS : ANSWER **FOUR (4)** QUESTIONS ONLY

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

- Q1 (a) Explain with the aid of appropriate block diagram the operation of thermal plants to generate electricity.

(16 marks)

- (b) The electrical power system in Malaysia is a complex interconnected system. Describe the main reasons for the interconnection of the electrical power network.

(9 marks)

- Q2 (a) Majority of the analysis of the network system which includes generators, transmission and distribution lines uses per unit applications. This simplify most of the calculations. Give **five (5)** advantages using this per unit technique in analyzing network system.

(5 marks)

- (b) A load with an impedance of 0.35 per unit V impressed across it has a current of 1.8 per unit A flowing through it . The load consumed 0.55 per unit W during this instant. Calculate the value of R and X expressed in per unit ohm and in actual ohm. Take a base current of 500 A and a base voltage of 30 kV.

(7 marks)

- (c) An radial distribution system with its rated value is shown as in the **Figure Q2(c)**. Obtain the per-unit reactance, the base kVA and the base kV for the system is chosen to be 100 MVA and 11 kV respectively at generator GS1 and GS2. Find the total reactance of the system as of at point **F** on the figure.

(13 marks)

- Q3** (a) In supplying power to the consumers, the power supply authorities have certain social obligation and basic responsibilities to fulfill. Explain in details the basic requirements of electric power flow.

(10 marks)

- (b) Power lines made up the important aspect of the electrical power system. Explain the factors considered in designing electrical power lines.

(6 marks)

- (c) Each conductor of the bundle-conductor line shown in **Figure Q3(c)** is ACSR, 1,272,000 cmil Pheasant. Find the inductive reactance in Ω/km and in Ω/mile per phase for $d = 45$ cm. Also find the per unit series reactance of the line if its length is 160 km and the base is 100 MVA, 345 kV. Given the Geometric Mean Radius (D_s) as following:

$$D_s = 0.0466 \text{ ft} = 0.0142 \text{ m}$$

(9 marks)

- Q4** (a) It has been a challenge for utility company to provide reliable electricity supply demand of their customer. This is because, electric power fault always occurs at the transmission lines. List all the types of fault that could appeared at the trasmission line and it percentages.

(5 marks)

- (b) Give **four (4)** reasons of doing fault analysis in power system application.

(4 marks)

- (c) In the network shown in **Figure Q4(c)**, using a base of 5 MVA, calculate the 3ϕ symmetrical fault current in amperes and the corresponding fault level (in MVA) when a fault occurs at point **P** on the feeder.

(16 marks)

- Q5** (a) Protection schemes must have high sensitivity in its operation when a fault occurs under minimum fault conditions. Discuss the consequences of a fault to the electrical power system.

(6 marks)

- (b) Explain fully **five (5)** basic design criteria requirement of a proper protection arrangement of electrical power systems.

(10 marks)

- (c) Circuit breaker is known as a switch that obviously apply to any circuit and received fault signal from a relay and causes the network to be open circuited due to fault in section of the circuit. Briefly explain **six (6)** characteristics of a circuit breaker to fulfill the job.

(9 marks)

- Q6** (a) In each distribution station there will be a system that control the power flows from the transmission lines to the consumer. It also steps down medium voltages to a lower voltage level using a transformer. A transformer is one of the equipment that is located inside the substation. List down **five (5)** other equipments that are located inside the substation.

(5 marks)

- (b) Circuit breakers are used to interrupt short circuit currents. Following are the types of circuit breakers : -

- (i) air blast circuit breakers.
- (ii) oil circuit breakers.
- (iii) vacuum circuit breakers
- (iv) SF₆ circuit breakers

Give detail explanations of each of the above circuit breaker.

(20 marks)

- End of Question -

FINAL EXAMINATION

SEMESTER / SESSION : I / 2013/2014
 COURSE : ELECTRICAL POWER SYSTEM

PROGRAMME : 3 DAE
 COURSE CODE: DAE 32403

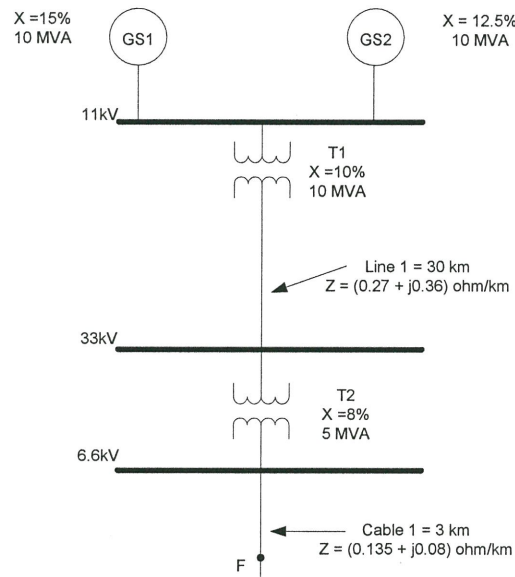


FIGURE Q2(c)

FINAL EXAMINATION

SEMESTER / SESSION : I / 2013/2014
COURSE : ELECTRICAL POWER SYSTEM

PROGRAMME : 3 DAE
COURSE CODE: DAE 32403

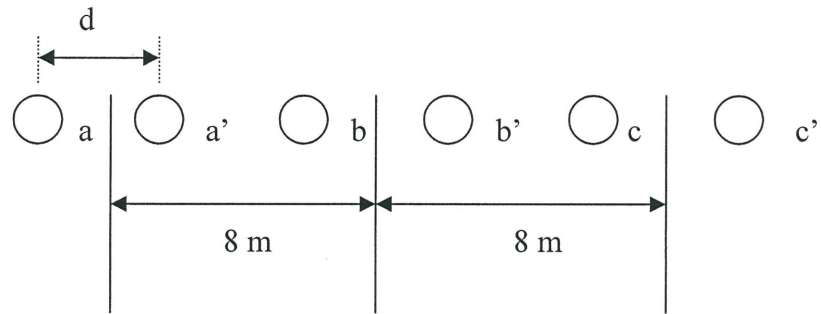


FIGURE Q3(c)

FINAL EXAMINATION

SEMESTER / SESSION : I / 2013/2014
COURSE : ELECTRICAL POWER SYSTEM

PROGRAMME : 3 DAE
COURSE CODE: DAE 32403

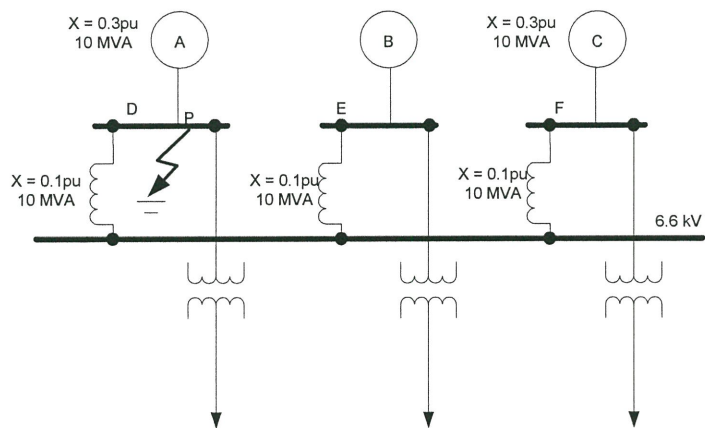


FIGURE Q4(c)