



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2015/2016**

COURSE NAME : POWER SYSTEM  
COURSE CODE : DAR 31603  
PROGRAMME : 2 DAR  
EXAMINATION DATE : JUNE/JULY 2016  
DURATION : 3 HOURS  
INSTRUCTIONS : ANSWER FIVE (5)  
QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

- Q1 (a) Illustrate with the aid of appropriate block diagram the operation of nuclear and hydro plants to generate electricity.

(10 marks)

- (b) Describe **three (3)** advantages of using single line diagram in solving problems related to power system network.

(3 marks)

- (c) The electrical power system in Malaysia is a complex interconnected system. Describe the advantages and the disadvantages of interconnection of the electrical power network.

(7 marks)

- Q2 (a) Express in rectangular and polar notations the phasor for the following quantities:

(i)  $i = 10 \sin(\omega t)$

(ii)  $i = 5 \sin(\omega t + \pi/3)$

(iii)  $v = 40 \sin(\omega t + \pi/6)$

Draw a phasor diagram representing the above voltage and currents.

(5 marks)

- (b) An impedance of  $(2 + j4) \Omega$  is connected in series with two impedances of  $(10 + j4) \Omega$  and  $(12 - j8) \Omega$ , which are in parallel. Calculate the magnitude and the power factor of the main current when the combined circuit is supplied at 240 V.

(7 marks)

- (c) A potential difference of  $240\angle 30^\circ V$  is applied to two branches connected in parallel. The currents in the respective branches are  $20\angle 60^\circ A$  and  $40\angle 30^\circ A$ .

Determine:

- (i) the apparent power (in kVA)
- (ii) the active power (in kW)

in each branch and in the main network in the form of  $A + jB$ .

(8 marks)

- Q3** (a) Majority of the analysis of a network system which includes generators, transmission and distribution lines uses per unit applications. Give **three (3)** characteristics of the per unit technique in analyzing network system.

(5 marks)

- (b) A radial distribution system with its rated values is shown as in the **Figure Q3 (b)**.

- (i) Determine the per unit reactance for the system
- (ii) Solve for the total reactance of the system as of at point **A** on the figure

Take the base kVA and the base kV for the system as 100 MVA and 11 kV respectively at the generator GS1, GS2 and GS3.

(15 marks)

- Q4** (a) In supplying power to the consumers, the power supply authorities have certain social obligation and basic responsibilities to fulfill. Describe the **five (5)** basic requirements of electric power flow.

(5 marks)

- (b) Transmission lines are made up of conductors, insulators and supporting structures. List in details the following aspect:

- (i) **three (3)** characteristic of conductors
- (ii) **five (5)** characteristic of insulators

(6 marks)

- (c) A single circuit three phase line operated at 50 Hz is arranged as shown in **Figure Q4(c)**. The conductors are ACSR Drake. Determine the inductive reactance per mile per phase. Given data from table, as  $D_s = 0.0373 \text{ ft}$

(9 marks)

- Q5** (a) It has been a challenge for utility company to provide reliable electricity supply demand for their customer. This is because, electric power fault always occurs at the transmission lines. State the **two (2)** categories of faults and its types that appeared at the transmission line.

(5 marks)

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

(4 marks)

- (c) A generating system has two 6.6 kV generators connected in parallel to a busbar via a respective transformer, as shown in **Figure Q5(c)**. Using a 10MVA, 6.6 kV base, determine the following requirement by considering a three phase fault occurrence at the end of the feeder connected from the busbar.

- (i) the fault current in amperes  
(ii) the fault MVA in pu

(11 marks)

- Q6** (a) Protection schemes must have high sensitivity in its operation when a fault occurs under minimum fault conditions. What are the **three (3)** consequences of a fault to the electrical power system.

(6 marks)

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

(8 marks)

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

(6 marks)

- Q7** (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 the **five (5)** other major equipments that are located inside the substation.

(10 marks)

- (b) Circuit breakers are used to interrupt short circuit currents. The following are the types of circuit breakers : -
- (i) air blast circuit breaker.
  - (ii) Oil circuit breaker
  - (iii) Vacuum circuit breaker
  - (iv) SF<sub>6</sub> circuit breaker

Give detail explanations of each of the above circuit breaker.

(10 marks)

**END OF QUESTION**

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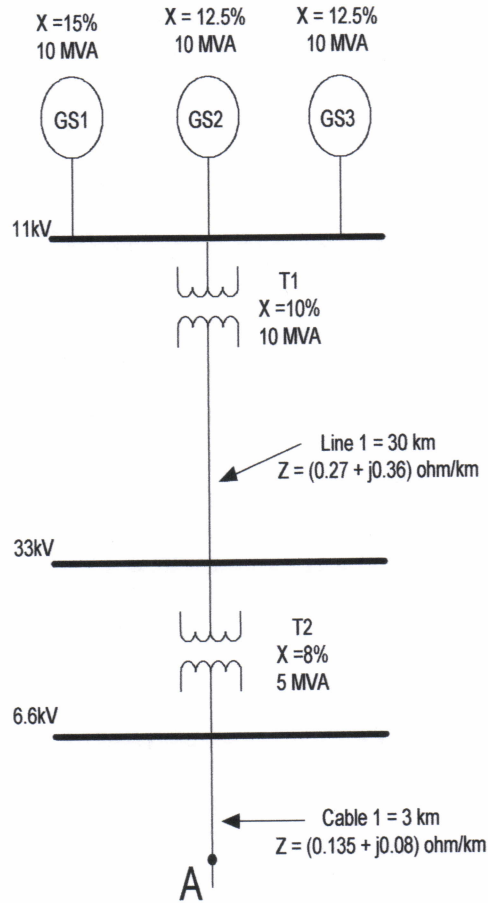
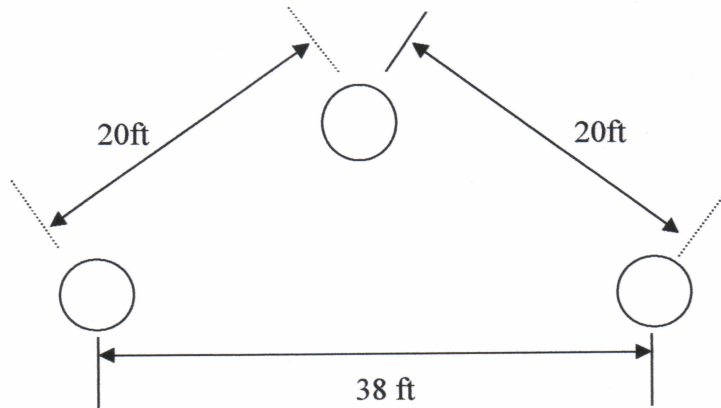


FIGURE Q3(b)

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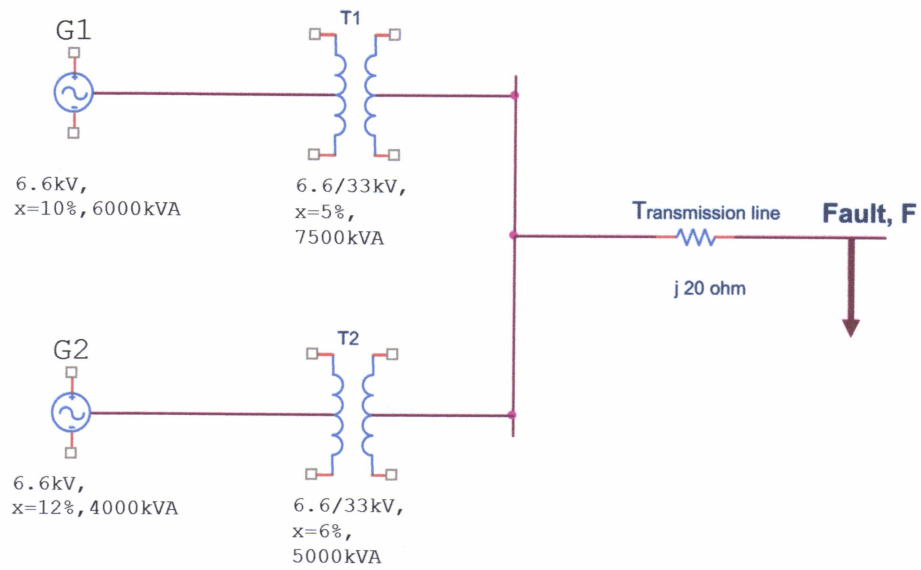


**FIGURE Q4(c)**

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**FIGURE Q5(c)**