UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE NAME	:	ELECTRICAL POWER SYSTEM
COURSE CODE	:	DAE 32403 / DEK 3213
PROGRAMME	:	3 DAE/DEE
EXAMINATION DATE	:	OCTOBER 2012
DURATION	:	2½ HOURS
INSTRUCTIONS	:	ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

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

(16 marks)

(b) List three (3) advantages of using single line diagram.

(3 marks)

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

(6marks)

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) An impedance has 0.35 per unit V impressed across it. The current is 1.8 per unit A and it consumed 0.55 per unit W. Calculate the value of R and X expressed in per unit ohm and in actual ohm. Take base current = 500 A and base voltage = 30 kV.

(7 marks)

(c) Figure Q2 (c) shows the reactance and the rated value which is based on the individual voltage value. Obtain the synchronous machine's voltage by taking 100 MVA as a base MVA.

(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) Transmission lines are made up of conductors, insulators and supporting structures. Explain the characteristic of conductors and insulators in details.

(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=45cm. Also find the per unit series reactance of the line if its length is 160 km and the base is 100MVA, 345kV. Given the Geometric Mean Radius (D_s) as following:

$$D_s = 0.0466\,ft = 0.0142m$$

(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) Consider circuit on Figure Q4(c), taking base of 100MVA, 11kV. By network reduction, find the fault current and the fault MVA level at busbar C. The data are given as follows:

G1	:	40MVA	10kV	20%
G2	:	20MVA	12kV	10%
Line AB	:	30Ω		
Line AC	:	15Ω		
Line DC	:	25Ω		
Line DB	:	20Ω		
Line BC	:	50Ω		
Load M	:	60MVA	10kV	5%

(16 marks)

Q5 (a) Protection schemes must have high sensitivity in its operation when a fault occurs under minimum fault conditions. What are 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.

(12 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) SF_6 circuit breakers

Give detail explanations of each of the above circuit breaker.

(13 marks)

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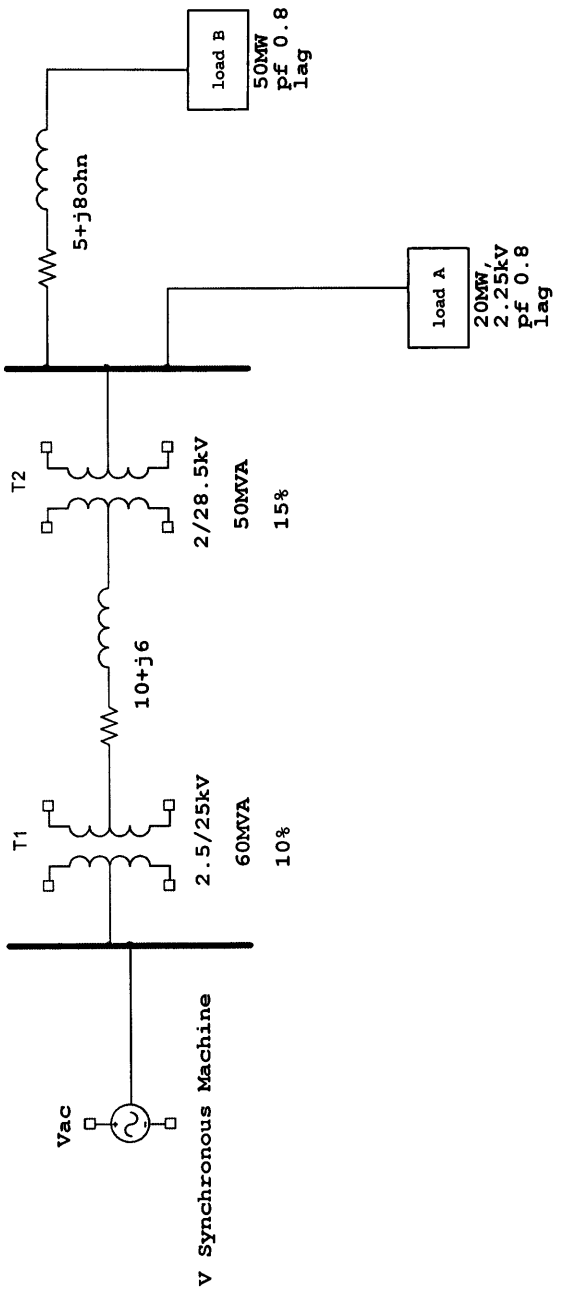

FIGURE Q2(c)

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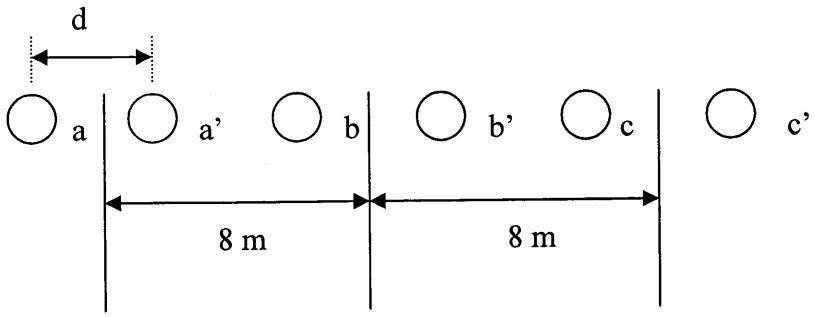

FIGURE Q3(c)

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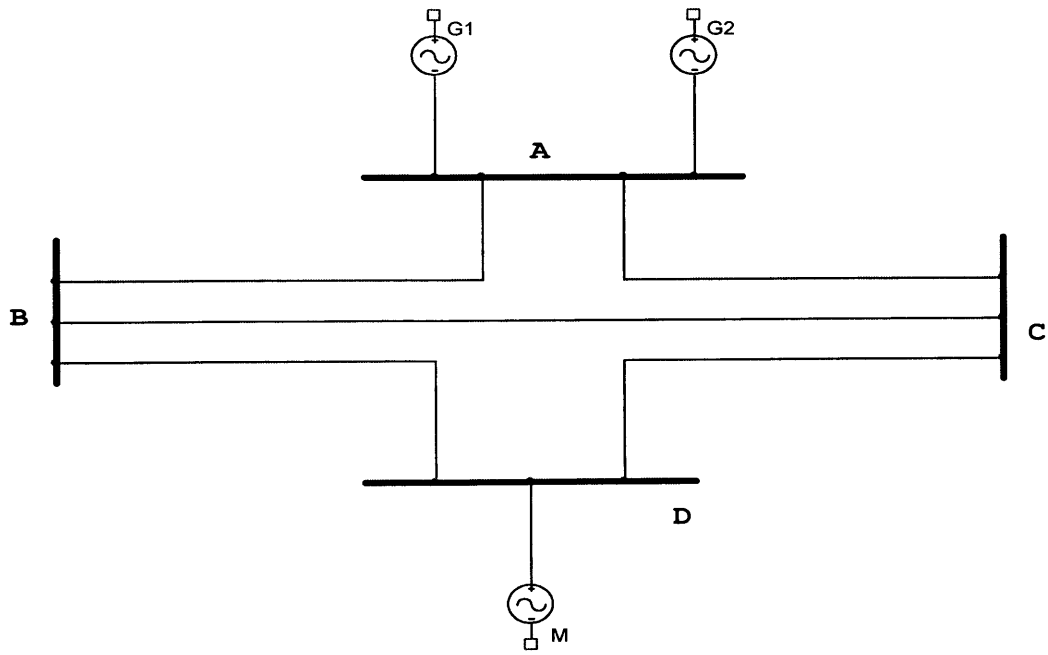

FIGURE Q4(c)