Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018

COURSE NAME	:	POWER SYSTEM
COURSE CODE	:	BEF 25503
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JUNE/JULY 2018
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) **Table Q1(a)** shows the examples of typical power transfer limits for different voltage transmission lines. Explain the significance of thermal ratings on the transmission line.

(2 marks)

(b) **Figure Q1(b)** shows a nominal π model representing a 270 kV three phase transmission line with 100 km long connected to a motor at the receiving end. Given the impedance, z = 0.036 + j0.3016 Ω/km and admittance, y = j5.49 x 10^{-6} S/km. Based on this model, find the following.

(i) The total impedance (Z), and admittance (Y) of the transmission line.

(2 marks)

(ii) The value of parameter ABCD.

(4 marks)

(iii) The receiving end current, $I_{R(1\emptyset)}$.

(4 marks)

(iv) The sending end voltage, V_s (V_{LL}).

(4 marks)

(v) The sending end current, $I_{S(1\phi)}$.

(2 marks)

(vi) Power factor at the sending end.

(2 marks)

Q2 (a) (i) Define the function of circuit breaker.

(1 mark)

(ii) Compare between air, SF6 and vacuum circuit breaker in terms of construction material.

(3 marks)

(b) List **FOUR (4)** types of switches used in distribution systems.

(4 marks)

(c) State **THREE (3)** items of protective equipment used in distribution systems.

(3 marks)

(d) Differentiate between feeder and distributer used in distribution systems.

(3 marks)

(e) Sketch the conceptual diagram for the following primary distribution lines:

(i) Radial primary circuit.

(2 marks)

(ii) Loop primary circuit.

(2 marks)

(iii) Ring main or network system.

(2 marks)

Q3 (a) Discover **ONE (1)** utility (in term of place) where single phase and three phase are used for electrical power distribution, respectively.

(2 marks)

(b) Differentiate the following distribution system types in terms of level of voltages that can be supplied.

(i) Single phase two wire system.

(1 mark)

(ii) Single phase three wire system.

(1 mark)

(iii) Three phase three wire system.

(1 mark)

(c) With the aid of diagram(s), illustrate the **THREE (3)** systems based on the number of wires required for three phase distribution systems.

(9 marks)

(d) Classify the **THREE (3)** levels of medium and high voltage in Malaysia based on their maximum demand.

(6 marks)

Q4 (a) Explain the purpose of grounding of distribution system.

(4 marks)

(b) Illustrate the grounding of distribution system.

(6 marks)

(c) From the answer in **Q4(b)**, point out the types of grounding exist in the distribution system.

(6 marks)

(d) Propose **TWO (2)** types of equipment where grounding is applied.

(4 marks)

Q5 (a) (i) Explain the purpose of protective power system.

(2 marks)

(ii) Explain how the protective mechanism works in power system.

(6 marks)

(iii) Explain **TWO (2)** consequences of fault in power system.

(4 marks)

(b) A radial system is shown in **Figure Q5(b)**.

(i) Find the fault currents for faults F_A, F_B, F_C, F_D, and F_E.

(6 marks)

(ii) Discover the relay settings based on current grading, assuming the relay error margin is 55%.

(2 marks)

– END OF QUESTIONS –

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Table Q1(a)

Voltage (kV)	Transfer Limit (MVA)
69	50
230	300
500	1000

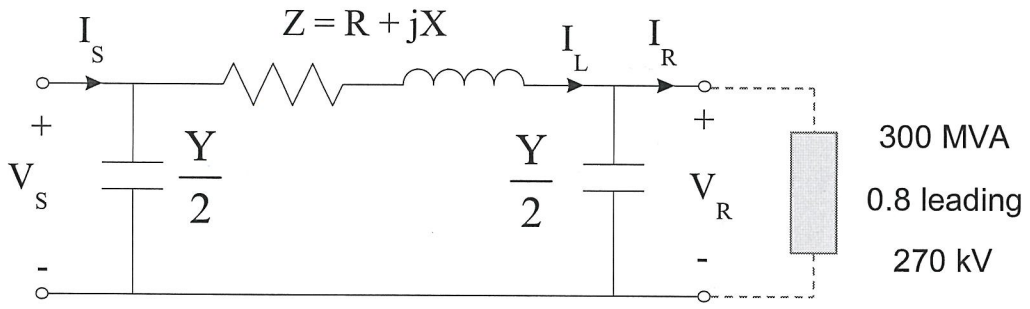

Figure Q1(b)

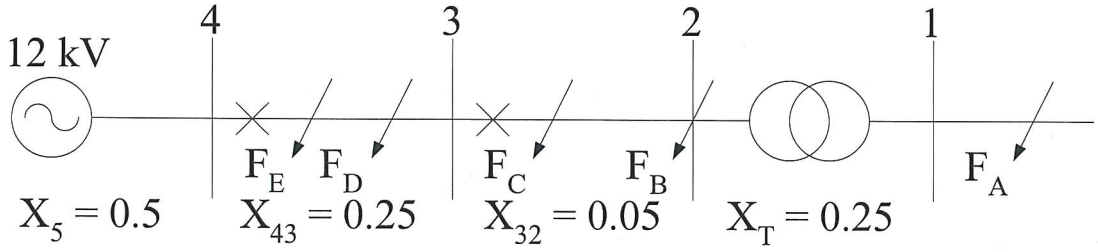

Figure Q5(b)

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RELATED FORMULAE

Apparent power:

$$P_{3\phi} = 3 \cdot V_m I_m \cos\phi$$

$$P_{3\phi} = \sqrt{3} \cdot V_L I_L \cos\phi$$

$$S_{3\phi} = 3 \cdot V_m \cdot I_m^* = \sqrt{3} \cdot V_L \cdot I_L^*$$

Medium transmission line:

$$I_S = CV_R + DI_R$$

$$V_S = AV_R + BI_R$$