UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	ELECTRICAL POWER SUPPLY SYSTEM
COURSE CODE	:	BBV 20103
PROGRAMME CODE	:	BBE
EXAMINATION DATE	:	JULY 2024
DURATION	:	3 HOURS
INSTRUCTIONS	:	1. ANSWER ALL QUESTIONS

2. THIS FINAL EXAMINATION IS CONDUCTED VIA
   ☐ Open book
   ☒ Closed book
3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **THREE (3)** PAGES

Q1 (a) Define briefly the National Grid System of Malaysia.

(5 marks)

(b) Explain the principle of electrical generation using a hydroelectric power station with the help of a suitable diagram.

(5 marks)

(c) Distinguish the difference between a steam turbine and a gas turbine for 7 (seven) main criteria within the context of principle, fuel type, thermal efficiency, startup time, environmental impact, maintenance, and cost.

(7 marks)

(d) Explain each phase of the four-stroke combustion engine cycle for a gasoline-powered vehicle along with suitable diagram.

(8 marks)

Q2 (a) Short electrical transmission is defined as the localized delivery of power across relatively short distances within local settlements or industrial locations.

(i) State 3 (three) assumptions made for short electrical transmission systems?

(3 marks)

(ii) Draw a schematic representation of a short transmission line complete with a load and label the relevant components used in the schematic along with the formula for calculating the voltage drop.

(3 marks)

(b) Explain the skin effect of a conductor for an AC short transmission line within the context of phenomenon, occurrence, frequency range, and influence of resistance.

(6 marks)

(c) An overhead three-phase transmission line with a power capacity of 5000kW supplies a factory with a voltage of 22kV at a power factor of 0.8 lagging. The line has a resistance of 4 ohms and a reactance of 6 ohms. Evaluate the value of:

(i) Voltage magnitude at the sending end.

(7 marks)

(ii) Percentage regulation.

(3 marks)

(iii) Transmission line efficiency.

(3 marks)

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Q3 (a) Explain briefly how the functions of the main components in a 33/11 kV substation contribute to its overall operation as follows:

(i)   Power Transformers
(ii)   Circuit Breakers
(iii) Isolators
(iv)   Busbars
(v)   Protection and Control Equipment
(vi)   Earthing System

(6 marks)

(b) Analyze the impact of locating a substation outside a building on electrical distribution, including operational, environmental, and societal considerations.

(9 marks)

(c) Apply your knowledge to choose the best busbar system for a small power station. Explain your choice based on reliability and maintenance ease.

(5 marks)

(d) Suggest a plan to minimize the environmental impact of an outdoor substation. Outline steps that could be taken in the design and operational phases.

(5 marks)

Q4 (a) Describe the radial and ring distribution arrangements focusing on their cost implications and suitability for supply.

(5 marks)

(b) Justify the suitability of an AC for power distribution for residential power consumption.

(5 marks)

(c) Discuss the main function of the following components in an electrical protection system:

(i)   Moulded Case Circuit Breaker.
(ii)   Air Circuit Breaker.
(iii) Oil Circuit Breaker.
(iv)   Current Transformer

(8 marks)

(d) Show an illustration of wiring for a single phase home distribution panel which consists of an MCCB, MCB, RCD which distributes to:

(i)   Room 1: A single socket, light bulb and a fan.
(ii)   Room 2: A water heater and a light bulb.
(iii) Room 3: Air conditioning, fan and a light bulb.

(7 marks)

- END OF QUESTIONS -

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