Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022

COURSE NAME	:	ENERGY ECONOMICS
COURSE CODE	:	MDL10303
PROGRAMME CODE	:	MDL
EXAMINATION DATE	:	9 FEBRUARY 2022
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWERS **ALL** QUESTIONS. 2. THIS FINAL EXAMINATION IS A **ONLINE** ASSESSMENT AND CONDUCTED VIA **OPEN BOOK**

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1 The supply of diesel to the consumers begins from the oil exploration and production works from the oil wells, followed by processing at the refinery before being transport to respective fuel stations. Given that the crude oil recovery rate from national oilfields is around 22%, the refinery operates at 92% efficiency level and transportation of fuel from refinery to the user involves a 5.3% loss. The refinery is assumed capable to extract 19 to 20 gallons of motor gasoline and 11 to 12 gallons of diesel fuel from one 42-gallon barrel of crude oil. A local trader wants to transport his vegetables stock to a wet market located 58km from his farm, using his diesel-fuelled lorry that has fuel economy of 18.3 mpg (US). Using appropriate assumptions and referring to values presented in **Table Q1**:

(a) Analyse and characterise the related costs involved from the oil wells to the consumers.

(5 marks)

(b) Predict how much crude oil is required to complete the trader's daily journey; and

(15 marks)

(c) Estimate the total costs needed by the trader to run the lorry to cover his daily journey.

(5 marks)

Q2 **(a)** Construct the basic concept for energy supply and demand. Using suitable example, elaborate this concept from the perspective of energy security.

(10 marks)

(b) **Figure Q2(b)** shows a typical schematic of a Hybrid Renewable Energy Systems (HRESs). Differentiate the advantages and the shortcomings of this system. Also evaluate the technical challenges in implementing this HRESs concept in real application.

(10 marks)

Q3 Japan's Monju nuclear power plant, a prototype fast-breeder reactor, was a high-priority national program to reuse and eventually produce nuclear fuel in a country with few energy sources of its own. It is in Fukui Prefecture. The plant was entirely custom designed. Each part was produced for a unique application and featured cutting-edge technology. Construction got underway in 1986, and initial criticality was attained in 1994. Test operations and inauguration were completed in August 1995. In December 1995, a major fire shut down the facility, resulting in a five-year delay. Test runs did not begin until 2010. Following further problems and serious maintenance flaws, in May 2013 Monju was ordered to suspend its preparations for restarting the reactor for commercial use. The Nuclear Regulation Authority declared the operator of Monju unqualified to operate the reactor, and in December 2016, the government closed the plant permanently. After more than 30 years and $12 billion in expenditures, Monju is said to have generated electricity for all of one hour during its 22-year lifetime. Decommissioning is expected to take another 30 years, until 2047, at a further cost of $3 billion. At a minimum, Monju will end up a 60-year, $15 billion venture with zero or negative benefits. The schematic of the Monju power plant is as **Figure Q3**.

Using the above information:

(a) Analyse the justifications on building the Monju Power Plant.

(2 marks)

(b) Estimate the detailed expenditure in constructing and commissioning the Monju Power Plant.

(4 marks)

(c) Elaborate what were the due considerations that Monju operator and the local government had identified prior to operating the power plant.

(4 marks)

(d) Evaluate how government can avoid similar incident from repeating in the future; and

(6 marks)

(e) Discuss how the plant's failure affected the economic activities and energy consumptions of people within the Fukui Prefecture.

(4 marks)

Q4 **(a)** Distinguish the externalities for electricity and fuel production.

(5 marks)

(b) As externalities exist from electricity and fuel production, the cost of its correction requires government intervention either through taxation or regulation. Propose five elements that you think can help the government to control the functioning of energy sectors.

(15 marks)

Q5 A small oil producer in a country, PETROMAS, plans to trade its oil products internationally or regionally.

(a) Construct suitable supply-demand diagrams for the following location of the company and explain each diagram.

(i) Company PETROMAS is in a country with a sufficient oil supply.

(5 marks)

(ii) Company PETROMAS is located in a country that resorts to importing to supplement the oil supply.

(5 marks)

(iii) Company PETROMAS is located in a net exporter country.

(5 marks)

(b) Briefly estimate the opportunity costs of the situation in **Q5(a)(i).**

(5 marks)

Q6 **(a)** An energy tax is a tax, excise, surcharge, or royalty that the government imposes on the production, distribution, or consumption of energy, electricity, or fuels.

(i) Determine three forms of energy taxes that bring to a country's revenue.

(3 marks)

(ii) Discuss the various purpose and importance of energy tax for a country.

(7 marks)

(b) The government of Malaysia has covered fuel subsidies, whereas the selling price of RON95 Petrol has been maintained at RM2.05 per liter since February 10, 2021, and RM2.15 per liter for Diesel since February 10, 2021. Meanwhile, the price of liquefied petroleum gas LPG has been maintained at RM1.90 per kilogram since June 2015. Analyse the impacts if the Malaysian government decided to reduce the fuel subsidies to the community?

(10 marks)

-END OF QUESTIONS-

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Table Q1: Prices of crude oil, RON95 and diesel fuels (December 2021)

No.	Item	Price
1	Brent Crude Oil	USD69.43/barrel
2	Petrol RON95	RM2.05/litre
3	EURO 5 Diesel	RM2.15/litre

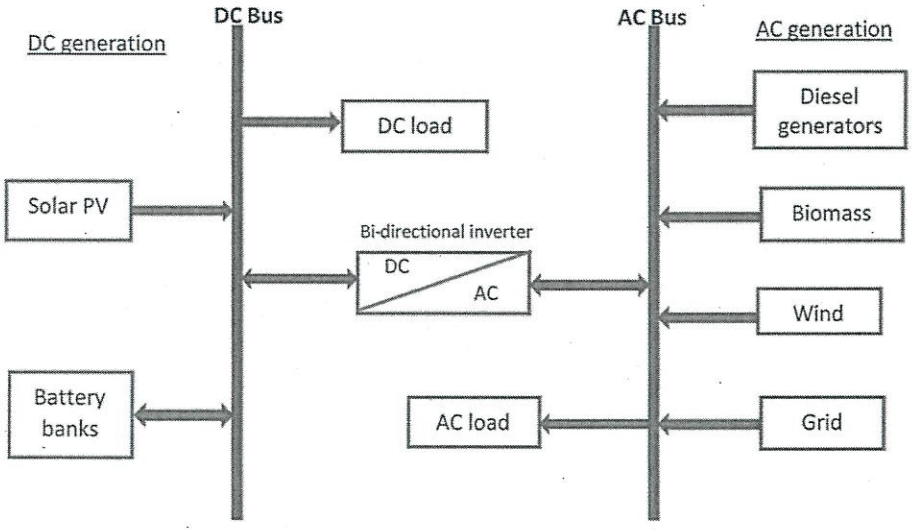

Figure Q2(b): Typical schematic of a Hybrid Renewable Energy Systems (HRESs)

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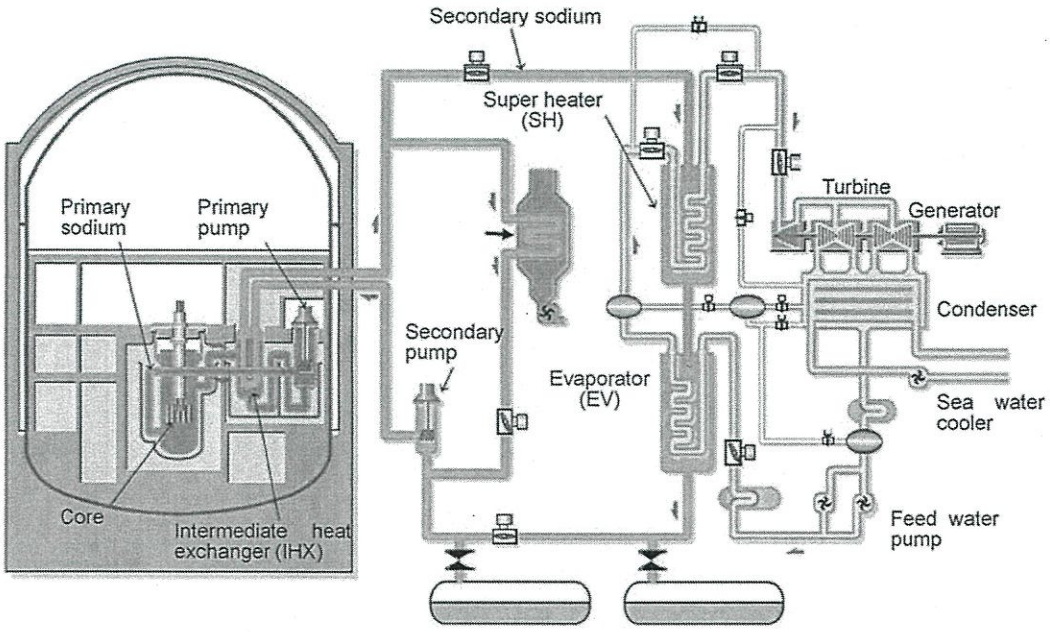

Figure Q3 : Schematic of Monju fast breeder reactor