



RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Sciences
Third Year - Semester I Examination – June / July 2018

PHY 3207 - ENERGY RESOURCES

Time: Two (2) hours

Answer **all four** questions

The use of a non-programmable calculator is permitted.

1.

- a. A country has to select suitable energy source to full fill their energy needs. Write down two main advantages and two main disadvantages of each of following energy resource,

- i. fossil fuel
- ii. solar cell
- iii. hydro-power.

(30 marks)

- b. Chemical formula of diesel is $C_{13}H_{28}$ and the density is 0.83 kg l^{-1} . Assuming complete combustion, calculate the mass of carbon dioxide released for every liter of diesel burnt. (The molar masses of carbon and hydrogen are 12 g mol^{-1} and 1 g mol^{-1} respectively).

(30 marks)

- c. Assume, energy density of diesel is $22.2 \times 10^6 \text{ J l}^{-1}$ and efficiency of a diesel turbine is 50%. Sri Lanka has produced $1.21 \times 10^9 \text{ W}$ of power by combustion of diesel in 2016.

- i. How many liters of diesel should be burnt per second in order to produce $1.21 \times 10^9 \text{ W}$ using above mentioned turbine?

ii. How much carbon dioxide is released per day?

(40 marks)

2.

a. Explain petroleum (Oil) refining process using relevant diagrams.

(50 marks)

b. Name commonly used coal mining methods and describe two of them.

(30 marks)

c. Name four nontraditional fossil fuels

(20 marks)

3.

a. Explain briefly the functions of three main components in a battery.

(30 marks)

b. Name three advantages of fuel cells over other types of energy conversion devices.

(20 marks)

c. Name six types of fuel cells.

(30 marks)

d. Write down anode and cathode reactions of each type of fuel cell.

(20 marks)

4. Table 1 shows the voltage and current density (J) data for a solar cell under 1000 W m^{-2} light irradiation.

a. Plot the voltage versus current density curve using suitable scale on the graph sheet provided.

(40 marks)

b. Calculate following parameters of this solar cell.

- i. The open circuit voltage of the cell.
- ii. The short circuit current density of the cell.
- iii. The maximum theoretical power density of the cell.
- iv. The maximum power density of the cell.

- 3
- v. The fill factor of the cell.
 - vi. The efficiency of the cell.

Table 1. Voltage and current density data

Voltage (mV)	500	450	400	350	300	250	200	150	100	50	0
J (mA/cm ²)	0	5	10	14	18	20	21	22	22.5	22.7	23

(60 marks)

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