

UNIVERSITY OF RUHUNA
FIRST EXAMINATION IN B.Sc. GREEN TECHNOLOGY (PART II) – September 2020

EN 1203: Renewable Energy I

Time 1 1/2 hrs

Structured and Essay Type

Index No:

Give answer to questions of Part A in the space provided.
 Use the given answer book to answer the questions of Part B.
 Only non programmable calculators are permitted.
 All questions carry equal marks.
 Mobile phones are not permitted.

Part A

Answer all questions.

01. (a) Fill in the blanks in the following table using figure 1.

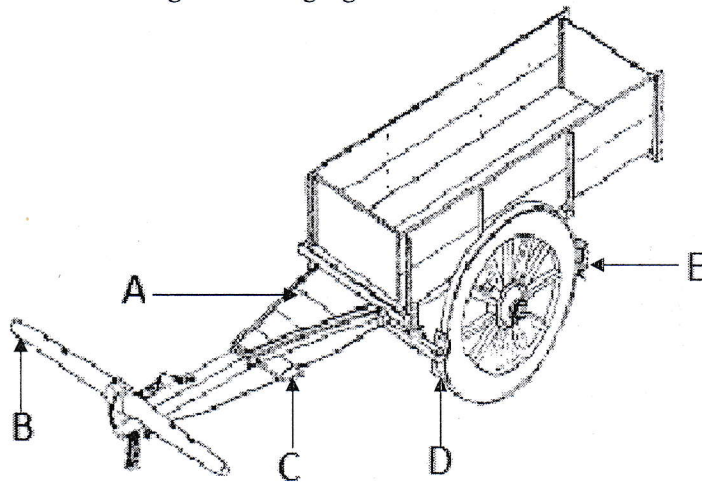


Figure 01

(20 Marks)

Figure	Name	Advantages	Disadvantages
A			
B			
C			
D & E			

(b) (i) Illustrate the energy conversion in electricity generation by wind energy in a wind farm.

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(10 Marks)

(ii) Sri Lankan government wishes to start a new project on construction of wind farms in Mannar to increase the electricity generation from wind energy. According to the project proposal, the dimensions of proposed wind turbine are given in figure 2;

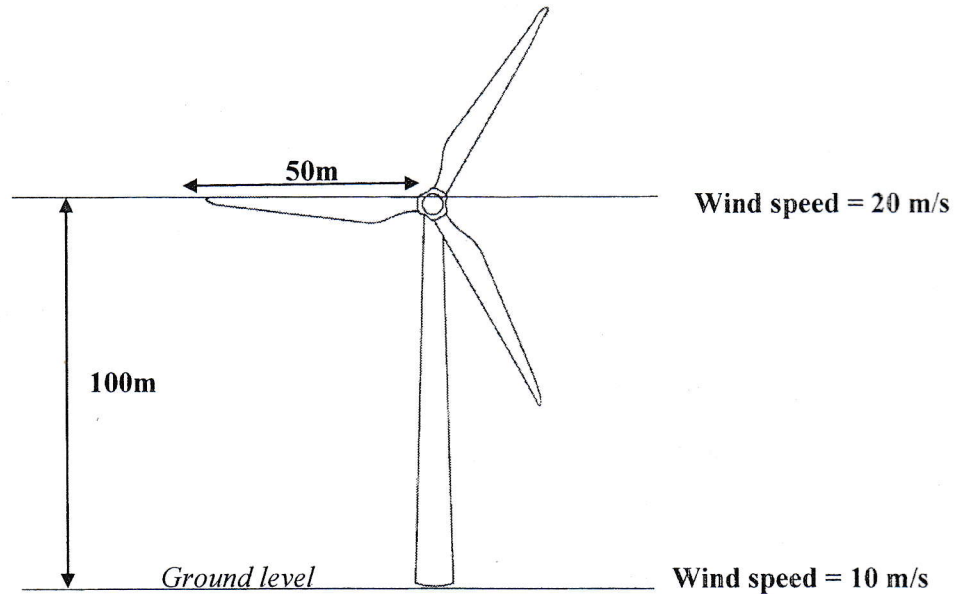


Figure 02

(iii) Calculate the volume and mass of a 1 meter thick parcel of air passing through the plane of the turbine blades (air density of 1.23 kg/m³).

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(10 Marks)

(iv) Calculate the wind power?

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(05 Marks)

(v) If the proposed turbine faced 20 m/sec for 12 hours of a particular day, calculate the total amount of electric energy it produced throughout that day (Assume this turbine only can convert 30% of power of the wind into usable electricity).

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(10 Marks)

(vi) If the blade length is reduced up to 30 m, what would be the wind power density? (assume all other conditions are same as above)

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(05 Marks)

(c) (i) Identify the Photo thermal conversion devices given in figure 3.

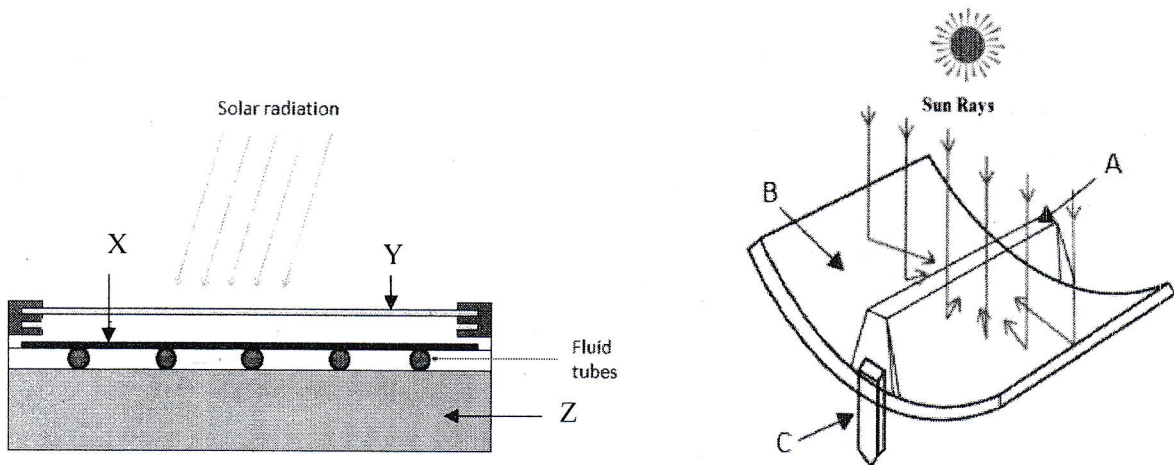


Figure 3

(06 Marks)

(ii) What are the properties and possible construction materials for parts give in figure 3?

Parts	Properties	Possible construction material
X		
Y		
Z		

(12 Marks)

(iii) Identify the parts of figure 3.

Parts	Name
X	
Y	
Z	
A	
B	
C	

(12 Marks)

Part B

**Answer only Two questions.
Question no. 1 is compulsory.**

01. (a) Discuss the limitations of electricity generation from solar energy. Suggest the possible option to minimize those limitations. (25 marks)
- (b) (i) Discuss the merit and demerits of the electricity generation from the coal and biomass. (25 marks)
- (ii) Describe oil and gas formation process in petroleum sources according to the different temperature profile using suitable sketches. (25 marks)
- (c) Critically discuss the given statement with relevant information and examples "Using wind to produce energy has fewer effects on the environment than many other energy sources". (25 Marks)
- (d) Discuss the importance of harnessing options for cattle and buffalos. (25 Marks)
02. (a) List the different indigenous ploughing implements drawn by the animal. (20 Marks)
- (b) Discuss briefly the characteristics of followings. (30 Marks)
- (i) Role of animal power in the field of agriculture.
- (ii) Why animal rights are important in agriculture?
- (c) A animal drawn at 2.5 km/h and pulls a 250mm Mouldboard plough. The ploughing depth is 140mm. Determine; (10 Marks)
- (i) Area ploughed per day
- (ii) Total horse power requirement for ploughing, if the draft of the animal is 500N (20 Marks)
- (d) Discuss the potential of utilization of geothermal energy in Sri Lanka. (20 Marks)
03. (a) Write down the different forms of energy conversion for the following operations using flowcharts. (15 Marks)
- (i) Food mixture operated by diesel engine
- (ii) Battery operated pedestal fan
- (iii) Solar powered water pump
- (b) What is the importance of following solar angles in harnessing solar energy? Elaborate your answer with suitable sketches. (15 Marks)
- (i) Solar Azimuth angle
- (ii) Solar Zenith Angle
- (iii) Solar hour angle

- (c) (i) Enlist the main components of photo-voltaic system. (15 Marks)
- (ii) Describe the operating principles of photovoltaic system using suitable diagram. (15 Marks)
- (iii) What are the photo-thermal applications used in Sri Lanka (15 Marks)
- (iv) The local government authority has planned to establish a power generation plant using solar energy to supply electricity for a rural area. It has been designed to produce 10 MWh for one year period. If the average annual insolation (hours of equivalent full sunlight on a horizontal surface) is 3500 hr, the amorphous silicon PV cells used for this project are seems to be economically viable. Calculate the required area of the solar panels. State your assumptions. (25 marks)

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