(15)

KIBABII UNIVERSITY

2020/2021 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER

MAIN EXAMINATIONS (January 2021)

FOR THE DEGREE OF BACHELOR OF SCIENCE IN RENEWABLE ENERGY AND BIOFUELS TECHNOLOGY

COURSE CODE: REN111

COURSE TITLE: Survey of Energy Sources

DATE: ~~14/1/2021~~ 20/05/2021 **TIME: 2:00-4:00PM**

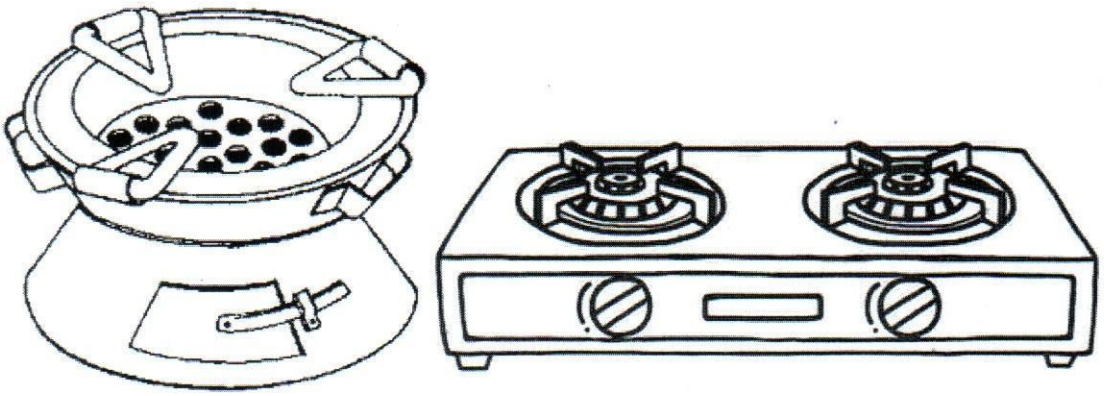
INSTRUCTIONS TO CANDIDATES

Answer question ONE and any other two questions

This paper consists of 4 printed pages. Please Turn over

Question One

(a)The figure below shows two energy conversion devices that provides the same service.



Device A *Device B*

(i) *Identify the service provided by the devices* *[2 Mark]*

(ii) *For each device explain the energy conversion process* *[4 Marks]*

(iii) *Depending on circumstance, the energy use from the devices can be consumptive or productive. Explain.* *[4 Marks]*

(b) Briefly explain the following forms of energy

(i) Biomass [2 Marks]

(ii) Fossil fuel [2 Marks]

(iii) Wind energy [2 Marks]

(iv) Ocean thermal energy [2 Marks]

(v) Wave energy [2 Marks]

(vi) Nuclear Energy [2 Marks]

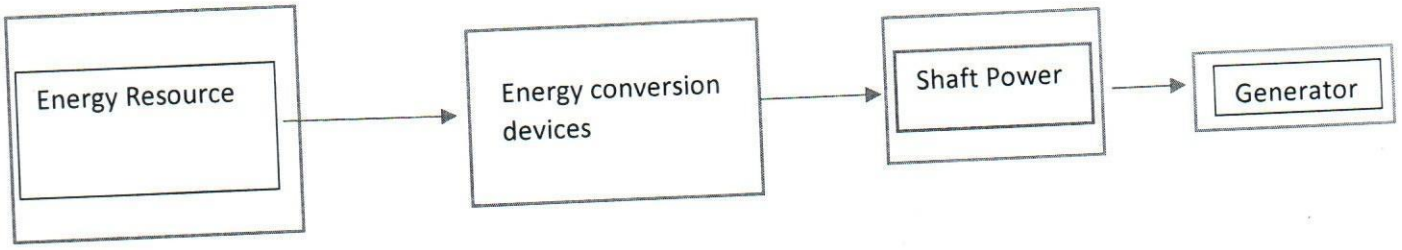
(c) Briefly describe the energy services commonly encountered in the following sectors

The built environment [4 Marks]

Agriculture [4 Marks]

Question Two

The diagram below shows energy flow in a power plant



You are given the following plants

Category A	Category B
Diesel power plant	Hydro power plant
Coal power plant	Wind turbine power plant

(a) For ONE power plant in Category A and ONE power plant in Category B [10 Marks]
   (i) Identify the energy resource being harnessed
   (ii) Name the energy conversion devices or devices involved that leads to shaft power
   (iii) Describe the energy conversion process or processes that take place in the energy conversion device or devices

(b) Describe the characteristics of the energy resources in
   (i) Category A [8 Marks]
   (ii) Category B

(c) Explain briefly why electricity is the preferred form of energy [2 Marks]

Question Three

Explain how the availability of energy affects the provision of the following services in rural areas
(i) Education [4 Marks]
(ii) Health [4 Marks]
(iii) Water [4 Marks]
(iv) Transport [4 Marks]
(v) Agriculture [4 Marks]

Question Four

Scenario A

AX household lives in an urban area in a fast-growing city in Kenya. The household has 2 adults and 3 children aged 3-15 years. They live in a 3-bedroom house on third floor in an apartment block. All the children go to school and the adults commute to their salaried employment.

Scenario B

BX a rural household in Kenya. The main livelihood activity in the area is subsistence agriculture. The household has 3 adults and three children aged 3-15 years. They live in a three roomed house with a detached kitchen. The home is not connected to the electricity grid. Water is obtained from a communal well 1 km away. The nearest primary and secondary school is 2.5km away. Two of the children are in school. One of the adults is elderly while the other two are middle-aged. The land available for cultivation and livestock rearing is 3.5 acres. They all derive their livelihood directly from. The land.

(a) (i) Identify all the most likely energy conversion devices found in the household AX
(iii) Describe the energy conversion process for the devices from the primary energy source to the end use [10 Marks]
(b) (i) Identify all the energy services required for household BX
(ii) Explain the likely methods of meeting energy needs for household BX [8 Marks]

(c) How does availability of energy affect methods of provision of goods and services? [2 Marks]

Question Five

The table below shows wattage of some typical household appliances.

Power consumption (Wattage)		
Appliance	**Wattage (range)**	**Average Hours of operation**
Radio	50	8
Mobile phone charger	10	2
Clothes Washer	350 - 500	.5
Clothes Dryer	1800-5000	.2
Electric Iron	1000-1500	.5
Hair Dryer	1200-1875	.25
Microwave Oven	750-1100	.2
Laptop	50	4
Refrigerator	725	12
32" flat screen Television	45	14 on weekends and 4 week days
Toaster	800-1400	.15
Immersion Water Heater	750-1000	.5
LED light	18	6
Energy saving compact fluorescent light	30	6

Estimate the cost of running the appliance for 1 month if 1kWh costs KES 15

Use this formula:

Energy Consumption / Day (KWh) =Power Consumption (Watts / 1000) × Hours Used / Day [20 Marks]