UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018

COURSE NAME : RENEWABLE RESOURCES

COURSE CODE : DAU 22202

PROGRAM : 2 DAU

EXAMINATION DATE : JUNE / JULY 2018

DURATION : 2 HOURS 30 MINUTES

INSTRUCTIONS : ANSWER **ALL** QUESTIONS IN SECTION A AND B. ANSWER **TWO (2)** QUESTIONS IN SECTION C.

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THIS EXAM PAPER CONSIST OF **EIGHT(8)** PAGES

SECTION A
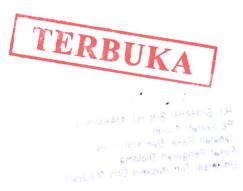
1.   Select which one among the following is not a renewable source of energy

     A.   Solar energy

     B.   Biomass energy

     C.   Hydro-power

     D.   Geothermal energy

2.   Another names for fuel cells are

     A.   hydrogen battery

     B.   carbon cell

     C.   nuclear cell

     D.   chromium cell

3.   The outermost layer of the earth is

     A.   magma

     B.   mantle

     C.   crust

     D.   solid iron core

4.   The one thing that is common to all fossil fuels is that they

     A.   were originally formed in marine environment

     B.   contain carbon

     C.   have undergone the same set of geological processes during their formation

     D.   represent the remains of one living organisms

5.   According to the scientific definition of work, pushing on a rock accomplishes no work unless there is

     A.   an applied force greater than its weight

     B.   a net force greater than zero

     C.   an opposing force

     D.   movement in the same direction as the force

6. Power is the best definition for
    A.   the rate at which energy is expended
    B.   work per unit of time
    C.   the rate at which work is done
    D.   any of the above

7. Most energy comes to and leaves the earth in the form of
    A.   radiant energy
    B.   chemical energy
    C.   nuclear energy
    D.   kinetic energy

8. The law of conservation of energy is a statement that
    A.   energy must be conserved and you are breaking a law if you waste energy
    B.   the supply of energy is limited so we must conserve
    C.   the total amount of energy is constant
    D.   energy cannot be used faster than it is created

9. Electrical energy can be converted to
    A.   chemical energy
    B.   mechanical energy
    C.   radiant energy
    D.   any of the above

10. Direct solar energy is used for
    A.   water heating
    B.   distillation
    C.   drying
    D.   all of the above

11. Solar radiation flux is usually measured with the help of a

   A.   anemometer

   B.   pyranometer

   C.   sunshine recorder

   D.   all of the above

12. Absorption of solar radiations at earth's surface occur due to presence of

   A.   ozone

   B.   water vapours

   C.   carbon di-oxide

   D.   all of the above

13. The ocean thermal energy conversion(OTEC) is uses

   A.   temperature difference

   B.   potential difference

   C.   energy difference

   D.   kinetic difference

14. Select one of the following is the best form of energy that can be used at any time.

   A.   wind energy

   B.   solar energy

   C.   tidal energy

   D.   heat energy

15. The aerobic digestion of sewage is used to produce

   A.   biomass

   B.   bio fuels

   C.   synthetic fuels

   D.   metal articles

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16.   To make transport fuel the bio ethanol is blended with

   A.   diesel

   B.   petrol

   C.   oil

   D.   kerosene

17.   Bio diesel is produced by the _____ of the vegetable oil.

   A.   transesterification

   B.   distillation

   C.   fermentation

   D.   rectification

18.   In dry steam hydrothermal plant, we use

   A.   Carnot cycle

   B.   Brayton cycle

   C.   Rankine Cycle

   D.   none of the above

19.   Winds having following speed are suitable to operate wind turbines.

   A.   5 – 25 m/s

   B.   10 – 35 m/s

   C.   20 – 45 m/s

   D.   30 – 55 m/s

20.   The wind intensity can be described by

   A.   Reynolds number

   B.   Mach number

   C.   Beaufort number

   D.   Froude number

SECTION B

Q1   (a)   The production process of ethanol from organic matter involved three main parts which are : fermentation, distillation and dehydration. Explain each part of this process in details.

(8 marks)

(b)   One of the seriously impact of fuel ethanol production is on food production. Explain why this matter could be happened.

(5 marks)

(c)   Starting with vegetables oil and animal fats, discuss how the biodiesel will be produced in the industry factory.

(7 marks)

Q2   (a)   A pumped hydroelectric storage reservoir has an area of $0.5 \ km^2$ and an average depth of 10 m. The water flows to a lower reservoir with a head of 100 m.
(i)   Calculate the total energy available in megawatt-hours.
($1 \ J = 2.78 \times 10^{-10} \ MWh$)
(ii)   Determine the total time that could the energy stored in this facility provide electricity for a town of 50,000 people if the average power requirement for each person is 800 W_e. Assume a generator efficiency of 90%.

(10 marks)

(b)   Consider an ideal flywheel, all of whose mass is located in a thin ring at the edge with a diameter of 0.7 m and a mass of 1.2 kg. If the wheel has an initial rotational frequency of 2 revolutions per second, calculate the length of time the rotational energy content of the wheel could illuminate a 60-W lightbulb (at 100% conversion efficiency). Let $k = 1$ and $E = 2\pi^2 kmr^2 f^2$.

(4 marks)

(c)   Explain how the energy can be stored by using superconducting magnetic energy storage (SMES) and describe the advantage using this equipment.

(6 marks)

SECTION C

Q3   (a)   The specific heat of water is 4180 J/(kg.°C). Calculate the energy required to heat 500 g of water from 20°C to 80°C.

(4 marks)

(b)   State The First Law of Thermodynamics and by using an example describe this law related to energy conservation.

(6 marks)

(c)   Fossil fuels and nuclear can be used to converted heat into mechanical energy and then into electricity. Describe the specific methods used to do that process.

(10 marks)

Q4   (a)   Basically the design of flat plate solar collector is use in active solar heating system. Describe the properties of plate solar collector that made its used for heating purposes.

(8 marks)

(b)   The release of greenhouse gases causes more global and long lasting adverse effects. Describe where these gases come from and how they contribute to the greenhouse effect.

(4 marks)

(c)   Wind is converted by the blades of wind turbines to generate electricity. Briefly discuss the **two (2)** types of blades used in wind turbines.

(8 marks)

Q5   (a)   An ocean wave has a height of 2 m and a period of 10 seconds. Calculate the power available in 1 km of wave front and its velocity and wavelength.

(8 marks)

(b)   Explain how does tidal power work.

(4 marks)

(c)   Discuss the different types of geothermal power plants and the environmental impacts of using geothermal energy.

(8 marks)

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- END OF QUESTIONS

FORMULA

$$\frac{P}{l} = \left[1.96kW/m^3.s\right]H^2T$$

$$v = \frac{\lambda}{T} = \frac{gT}{2\pi}$$

$$\lambda = \frac{gT^2}{2\pi}$$

$$Q = mC\Delta T$$

$$E = mgh$$

$$m = \rho V$$