JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

UNIVERSITY EXAMINATIONS FOR THE DEGREE IN SCIENCE IN RENEWABLE ENERGY TECHNOLOGY AND MANAGENT

4TH YEAR 1ST SEMESTER 2017/2018 ACADEMIC YEAR

CENTRE: MAIN CAMPUS

COURSE CODE: TET3412

COURSE TITLE: ENERGY AND CLEANER PRODUCTIONS

EXAM VENUE: CR **STREAM: BSc REN ENERGY TECH. & MGT.**

DATE: 20/12/2017 **EXAM SESSION: 9.00 – 11.00AM**

DURATION: 2 HOURS

Instructions

1. **Answer question 1 (Compulsory) and ANY other two questions**
2. **Candidates are advised not to write on question paper**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room**

Question 1: **(30 MARKS)**

a) Define and give examples of pollution reduction techniques. (6 marks)

b) Briefly explain the following as applied in industrial cleaner production:

i) Industrial parks [2 marks]

ii) Eco-design strategy wheel [2 marks]

iii)Life cycle assessment [2 marks]

iv)Environmental management systems [2 marks]

c) Giving examples, differentiate between pollution control and pollution prevention.[2 marks]

d) i. Define Industrial Environmental Management (IEM) practices and provide a staircase chart showing the main concepts and the sub concepts that form the IEM practices. (6 MARKS)

ii. Name and briefly describe the three main types of concepts that make up the IEM practices**.** (3 MARKS

iii. Cleaner production is a process that involves five main basic principles. Name the five principles and briefly outline an option that can be adopted under each principle. (5 MARKS)

Question 2: **(20 MARKS)**

a) Considering natural gas/oil transportation and electricity transmission, discuss two environmental impacts associated with natural gas/oil transportation and two impacts associated with electricity transmission. (12 MARKS)

b) Several power sources give out unwanted flue gases that have to be removed before being released into the atmosphere.

i. Name and clearly explain the four main sources of unwanted flue gases. (4 MARKS)

ii. An electrostatic precipitator is used to remove minute solid particles from flue gases. Describe the whole process with the aid of a detailed diagram.(4 MARKS)

Question 3: **(20 MARKS)**

Using the industrial leather tanning process, explain how one may use material balance data to develop environmental performance indicators.

Question 4: **(20 MARKS)**

Energy processes have several impacts associated with them which vary depending on the type of energy.

a) Under the three main types of conventional energy sources (thermal, hydro-electric and nuclear power plants), mention and clearly explain one environmental impact in each. (6 MARKS)

b) Several non-conventional energy sources are available with the main types being wind, solar, geothermal, biomass and tidal power. For biomass, geothermal and wind power, outline and clearly explainone environmental impact associated with each. (6 MARKS)

c) Disposal of waste (solid and liquid) is undertaken using three main processes. Mention each method, clearly describing how it is done using illustrations if necessary and outline two environmental impacts associated with each method. (8 MARKS)

Question 5: **(20 MARKS)**

Cleaner production assessment is applied to identify inefficient use of resources such as energy.

a) Define clearly what cleaner production assessment refers to giving a flow chart summarizing the phases involved in a cleaner production assessment process.(5 MARKS)

b) For each phase provided in the flow chart in (a) above, mention the phase, clearly outline the main objective of that phase and describe one activity undertaken under that phase. (15 MARKS