KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER
SPECIAL/SUPPLIMENTARY EXAMINATIONS

FOR THE DEGREE OF
B.SC RENEWABLE ENERGY AND BIOFUELS TECHNOLOGY

COURSE CODE: REN 315

COURSE TITLE: THERMODYNAMICS II

DURATION: 2 HOURS

DATE: 12/1/2022 **TIME: 2-4PM**

INSTRUCTIONS TO CANDIDATES

(i) Answer **Question 1 (Compulsory)** and any other **TWO** questions
(ii) All symbols have their usual meaning
(iii) Use steam tables provided

This paper consists of **3** printed pages. Please Turn Over

QUESTION ONE (Compulsory) – 30 MARKS

a) What is the function of an air compressor?

(1 Mark)

b) Use a P-V diagram to explain the processes in a Diesel cycle

(5 Marks)

c) With the help of a suitable sketch, explain two limitations of using a Carnot cycle to analyse a steam plant, and recommend the most suitable cycle

(5 Marks)

d) What do you understand by the following terms?

(i) Back pressure turbines **(2 Marks)**

(ii) Pressure compounding in turbines **(2 Marks)**

e) Give three implications of the Second Law of Thermodynamics

(5 Marks)

f) List any five features that have been done to improve the performance of ICEs

(5 Marks)

g) State Gibbs-Dalton Law

(5 Marks)

QUESTION TWO – 20 MARKS

The pressure and temperature at the beginning of compression in an Otto cycle are 0.97 bar and 50^0C respectively. The compression ratio is 5. The heat supplied during the cycle is 930 kJ/kg.

Calculate for this air standard cycle:

a) The maximum temperature attained

(12 Marks)

b) Thermal efficiency

(4 Marks)

c) The net work done

(4 Marks)

QUESTION THREE – 20 MARKS

Steam at 70 bar and 300^0C is contained in a rigid cylinder of volume 0.02 m^3. The cylinder is cooled until the pressure is 40 bar.

a) Determine the state of steam after cooling

(6 Marks)

b) Calculate the amount of heat rejected by steam

(7 Marks)

c) Calculate the change in entropy

(5 Marks)

d) Sketch the process on a t-s diagram indicating the area which represents heat flow

(2 Marks)

QUESTION FOUR – 20 MARKS

A steam power plant operates between a boiler pressure of 42bar and a condenser pressure of 0.035bar. Steam is initially superheated at 500^0C before entry into the turbine. Feed pump work is negligible.

Use the Rankine Cycle to determine the:

a) Thermal efficiency of the cycle

(16 Marks)

b) Work Ratio

(2 Marks)

c) Specific steam consumption

(2 Marks)