KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2016/2017 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER
SUPPLEMENTARY EXAMINATIONS
FOR THE DEGREE OF B.ED (SCIENCE)

COURSE CODE: SPH 415

COURSE TITLE: THERMODYNAMICS

DURATION: 2 HOURS

DATE: 21ST SEPTEMBER 2017  TIME: 3 – 5PM

INSTRUCTIONS TO CANDIDATES
- Answer QUESTION ONE (Compulsory) and any other two (2) Questions.
- Indicate answered questions on the front cover.
- Start every question on a new page and make sure question’s number is written on each page.

This paper consists of 3 printed pages. Please Turn Over
QUESTION ONE (30 MARKS)

a) Define the term entropy (1 mark)

b) State the Zeroth Law of thermodynamics (1 mark)

c) Air is expanded reversibly behind a piston according to a law PV = constant. If the final volume is twice the initial volume and the work done on the fluid during the expansion is $34.7 \times 10^3$ Nm, determine the initial volume and pressure. Take the final volume as 0.1 m$^3$. (3 marks)

d) Distinguish in the principle of operation between a refrigerator and a heat engin (2 marks)

e) What do you understand by the following terms as used in thermodynamics: System, Boundary, Diathermal wall, Thermal contact and A process (5 marks)

f) State both the first and the second laws of thermodynamics (3 marks)

g) State and explain any three classes of systems (6 marks)

h) Conditions for reversible process, (4 marks)

i) A fluid of volume 0.05 m$^3$ is contained behind a piston at a pressure of $1.0 \times 10^6$ N/m$^2$. After a reversible expansion of constant pressure, the final volume is 0.2 m$^3$. Calculate the work done by the fluid. (4 marks)

j) State the Carnot's theorem (1 mark)

QUESTION TWO (20 MARKS)

a. Show that the work done during expansion of gas is

$$W = nRT \ln \frac{p_1}{p_2}$$

(12 marks)

b. Explain four processes in thermodynamics (8 marks)

QUESTION THREE (20 MARKS)

Draw a simplified representation of the actual cycle for a petrol engine then derive an equation for its efficiency (20 marks)

QUESTION FOUR (20 MARKS)

a. At the beginning of a reversible expansion according to a linear law, the fluid behind a piston exerts a force of 8 KN on the piston. The expansion causes the volume to increase from 0.05 m$^3$ to 0.2 m$^3$. If the effective cross-sectional area and final pressure are 0.008 m$^2$ and 200 KN/m$^2$ respectively. Calculate the work done on the fluid (6 marks)

b. Show that the heat supplied during Isothermal Process is given by

$$Q = TR \ln \frac{V_2}{V_1} = RT \ln \frac{P_1}{P_2}$$

(14 marks)
Using Maxwell's thermodynamic relations show that $C_p - C_v = R$ (20marks)