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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 mar)
- b) State the Zeroth Law of thermodynamics (1 mark)
- c) Air is expanded reversibly behind a piston according to a law $PV = \text{constant}$. If the final volume is twice the initial volume and the work done on the fluid during the expansion is $34.7 \times 10^3 \text{ Nm}$, determine the initial volume and pressure. Take the final volume as 0.1 m^3 . (3marks)
- d) Distinguish in the principle of operation between a refrigerator and a heat engine (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 (6marks)
- h) Conditions for reversible process, (4mks)
- i) A fluid of volume 0.05 m^3 is contained behind a piston at a pressure of $1.0 \times 10^6 \text{ N/m}^2$. After a reversible expansion of constant pressure, the final volume is 0.2 m^3 . Calculate the work done by the fluid.(4mks)
- j) State the Carnots theorem (1 mark)

QUESTION TWO (20MARKS)

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

$$W = nRT \ln \frac{p_1}{p_2} \quad (12\text{marks})$$

b. Explain four processes in thermodynamics (8marks)

QUESTION THREE (20MARKS)

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

QUESTION FOUR (20MARKS)

- a. At the beginning of a reversible expansion according to a linear law, the fluid behind a piston exerts a force of 8KN 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

$$\therefore Q = TR \ln \frac{V_2}{V_1} = RT \ln \frac{P_1}{P_2} \quad (14\text{marks})$$

QUESTION FIVE (20MARKS)

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