



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE
(A CONSTITUENT COLLEGE OF JKUAT)
Faculty of Engineering and Technology

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING
Bachelor of Science in Mechanical Engineering

EMG 2302 : THERMODYNAMIC II

Year 3 Semester 1 Examinations

SPECIAL/SUPPLEMENTARY EXAMS

SERIES: March 2012

TIME: 2 Hours

INSTRUCTIONS TO CANDIDATES.

You should have the following for this examination

- Answer booklet
- Scientific calculator

This paper consists of **FIVE** questions

Answer **ANY THREE** questions

Maximum marks for each question are shown.

This paper consists of **THREE** Printed pages.

Question One

Explain the following terms

- i. Available Energy
 - ii. Unavailable Energy (4marks)
- b) Derive the equation for the decrease in available energy when heat is transferred through a finite temperature different. (9 marks)
- c) A system at 500K receives 7200kJ/min from a source at 1000K. The temperature of the atmosphere is 300K. Assuming that the temperatures of the system and source remain constant during heat transfer. Calculate

- i. The entropy produced during heat transfer
- ii. Decrease in available energy after heat transfer.

(7 marks)

Question Two

a) Define the following terms

- i. Mole fraction
- ii. Partial pressure.

(4 marks)

b) Explain Gibbs-Dalton Law

c) The pressure and temperature of 4 Kg of O₂ and 6 Kg of N₂ are 4 bar and 27°C respectively. For the mixture determine the following.

- i. The mole fraction of each component
- ii. The average molecular weight
- iii. The specific gas constant
- iv. The volume and density
- v. The partial pressures and partial volumes.

(9 marks)

Question Three

a) Define the following terms

- i. Dry air
- ii. Saturated air
- iii. Wet-bulb temperature
- iv. Dry- bulb temperature

(6 marks)

b) Explain the adiabatic saturation process.

(6 marks)

c) A Tank contains 10 kg of dry air and 0.1 kg of water vapour at 30°C and total pressure of 100kPa. Calculate the following

- i. Specific humidity
- ii. Relative humidity
- iii. The volume of the tank.

(8 marks)

Question Four

a) Describe a regenerative cycle with a single feed water heater and show it's efficiency
(12 marks)

b) In a regenerative cycle, having one feed water heater, the dry saturated steam is supplied from the boiler at a pressure of 30 bar and the condenser pressure is 1 bar ,the steam is bled t a pressure of 5 bar .calculate

- i. The amount of bled steam per Kg of steam supplied and the efficiency of the cycle.
- ii. The efficiency without regenerative feed heating.

(8 marks)

Question Five

- a) Explain the various operations of Rankine cycle and derive it's efficiency. (10 marks)
- b) In Rankine cycle, the steam at inlet to turbine is saturated at a pressure of 35 bar and the exhaust pressure is 0.2 bar. Calculate
- i. The pump
 - ii. Turbine work
 - iii. Rankine efficiency
 - iv. Condenser heat flow
 - v. The dryness at the of expansion.
- (10 marks)