TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MARINE ENGINEERING

EMR 2313 : APPLIED THERMODYNAMICS II (PP2)

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: Pick Date Select Month Pick Year

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt any THREE questions.

Do not write on the question paper.

Question ONE

a) Sketch a well labelled Piston cylinder arrangement showing; piston rings, inlet and exhaust valves, crank shaft and connecting rod. (8 marks)

b) A piston-cylinder arrangement has a piston with a bore diameter of 80mm, a stroke length of 80mm and a Torque arm of 0.35m. It can attain a maximum speed of 1500 rpm in 20 seconds. Calculate its fuel consumption capacity (cc) and the power it develops. (12 marks)

Question TWO

a) Explain any FIVE differences between an internal combustion and compression ignition engines (10 marks)

b) A 4 stroke, 4 liter capacity petrol engine running at 3000rpm and an efficiency ratio of 0.5 sucks in air at 0.7 bar and 10◦C. if its air to fuel ratio is 13:1 and its calorific value is 45 MJ/kg, calculate the heat released by the combustion process. (10 marks)

Question THREE

a) State any FIVE criteria used for classification and identification of turbines stating an example for each criterion. (10 marks)

b) A turbine sucks in air at initial temperature and pressure of 1 bar and 20◦C. The expansion ratio is 18/1 and the cut off ratio is 1.15. The maximum cycle pressure is 1360 K and the total heat input is 1 KJ per cycle. Calculate the thermal efficiency and network output of the cycle. (10 marks)

Question FOUR

a) Using sketches explain the working principles of;
   i. A centrifugal compressor
   ii. A straight lobe compressor (8 marks)

b) A compressor operating on the Otto cycle takes in air at 100KPa and 20◦C and after compression its temperature rises to 1500◦C. Calculate the net work done. Take Cv=718KJ/Kg, ϒ=1.4, R=287KJ/KgK (12 marks)

Question FIVE

a) Using a schematic sketch, explain the working principles of A jet thrust engine gas turbine (8 marks)

b) A gas turbine expands 4 kg/s of air from 12 bar and 900◦ C to 1 bar adiabatically with an isentropic efficiency of 87%. Calculate the exhaust temperature, the power output and the efficiency. Take ϒ = 1.4 and Cp = 1005 J/kg K (12 marks)