

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 $\Upsilon = 1.4$ and Cp = 1005 J/kg K

(12 marks)