

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 (PP1)

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) Explain any FOUR criteria used to classify and identify Internal Combustion engines giving an example for each criteria. (8 marks)
- b) A 4 stroke carbureted engine runs at 2 500 rev/min. The engine capacity is 3 liters. The air is supplied at 0.52 bar and 15°C with an efficiency ratio of 0.4. The air fuel ratio is 12/1. The calorific value is 46 MJ/kg. Calculate the heat released by combustion.

(12 marks)

Question TWO

- a) Using sketches explain the FOUR strokes of a spark ignition engine piston. (12 marks)
- b) A four stroke carbureted engine runs at 2500 rpm. The engine capacity is 3000cc. Air is supplied at 0.52 bar and 15°C with an efficiency ratio of 0.4. The air fuel ratio is 12/1 and the calorific value of fuel is 46 MJ/Kg. calculate the heat released by combustion.

Question THREE

- a) Using sketches explain the working principles of the following compressors;
 - i. Sliding vane
 - ii. Straight lobe

(9 marks)

b) A single stage reciprocating compressor operates polytropically according to the law $PV^n = C$. It sucks in 1 m³ of air at 1.013 bars and 15°C and compresses it to 7 bars. If the efficiency is 83% and n=1.35 calculate the indicated power of the compressor.

(11 marks)

Question FOUR

- a) Using explain the operational principals of a propeller (turbo-prop) engine gas turbine. (8 marks)
- b) A gas turbine uses the Joule cycle. The pressure ratio is 6/1. The inlet temperature to the compressor is 10°C. The flow rate of air is 0.2 kg/s. The temperature at inlet to the turbine is 950°C. Calculate the following.

i. The cycle efficiency. ii. The heat transfer into the heater. iii. The net power output. Take $\Upsilon = 1.4$, Cp = 1.005 kJ/kg K

Question FIVE

- a) Using a flow chart diagram explain how electricity is produced by a fossil fueled steam turbine plant (7 marks)
- b) A steam turbine with a pressure ratio of 6:1 intakes 15 kg of steam per second at 15°C with a maximum cycle temperature of 600°. The efficiencies of the compressor and turbine are 82% and 85% respectively. The compression process has a Cp of 1.005KJ/KgK and Υ of 1.4, while the expansion process has a Cp of 1.11KJ/KgK and Υ of 1.332. Calculate the power output of the turbine.

(13 marks)

(12 marks)