



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING (PLANT OPTION)

PLANT TECHNOLOGY V

EPL 2301

YEAR III SEMESTER 1

SPECIAL/SUPPLEMENTARY EXAMINATIONS

SERIES: OCTOBER, 2011

TIME: 2HRS

INSTRUCTION TO CANDIDATES

You should have the following for this examination

- Drawing instruments
- Scientific Calculator
- Drawing paper, A2

This paper consists of FIVE questions in three sections A,B and C

Question ONE in section A is Compulsory. Answer any other TWO questions, one from each section B and C

Maximum marks for each part of a question are as shown.

Q1. a) List any **FOUR** major types of fire fighting equipments.

(2 marks)

b) Explain the procedure of fighting a fire outbreak in a multi- storey building.

(10 marks)

c) Outline **THREE** properties each for the following fuels:

(i) Anthracite coal

(ii) Petrol

(iii) Peat

(iv) natural gas

(8 marks)

Q2. a) Define the terms as applied to I.C. engines:

(i) detonation

(ii) knock

(iii) two stroke

(3 marks)

b) With the aid of sketches describe the operation four stroke engines

(10 marks)

c) Outline the procedure of removing a cylinder head from an engine which has its auxiliaries already disentangled.

(7 marks)

Q3 a) State the function of the following component in an engine:

(i) camshaft

(ii) alternator

(iii) fuel pump

(7 marks)

b) Describe with aid of diagrams, where applicable, the procedure of inspecting a crankshaft of an already dismantled I.C. engine.

(6 marks)

c) In a test on a two-stroke, heavy-oil, marine engine, the following data was obtained:

- oil consumption, 4.05;
- calorific value of oil, 43000kj/kg;

- net brake diameter, 1m;
 - mean effective pressure, 275kN/m²;
 - cylinder diameter, 0.20m;
 - stroke, 0.250m;
 - speed, 6revs/s;
 - a) the mechanical efficiency;
 - b) the indicated thermal efficiency;
 - c) the brake thermal efficiency;
 - d) the quantity of jacket water required per minute if 30% of the energy supplied by the fuel is absorbed by this water. Permissible rise in temperature is 25°C.
- (6 marks)

Q4. a) Outline the daily, weekly and monthly maintenance of a large diesel engine.

(6 marks)

b) A S.I. engine has been diagnosed with the following problems:

- i) lack of power
- ii) overheating

Suggest any two causes and their remedies for each of the problem.

(8 marks)

c) An oil engine uses fuel oil having a composition by mass of C, 86% and H₂, 14%. The fuel oil is used at the rate of 55kg/h. The air supply is 20% in excess of the stoichiometric requirement. The air is supplied to the engine at a pressure of 96.5kN/m² and a temperature of 17°C through a pipe of 150 mm diameter.

Determine,

- (i) the percentage analysis of the exhaust gas by mass;
 - (ii) the velocity of the air in the supply pipe in m/s.
- (take R=0.287 kJ/kg K)

(7 marks)

5 a) Explain the meaning of the following terms as used in combustion processes:

- (i) excess air

- (ii) dry flue gases
- (iii) Rich mixture

(3 marks)

b) With the aid of a sketch describe the working of Orsat apparatus;

(10 marks)

c) The following results were obtained during an experiment with a continuous flow type gas calorimeter;

volume of gas burned at 16°C and 120mm water pressure = 0.007m³

volume of cooling water flowing during test = 2.185x10⁻³m³

temperature of cooling water at inlet to calorimeter = 14°C

temperature of cooling water at outlet from calorimeter = 28°C

water collected during test = 3.5x10⁻⁶m³

barometer = 758mm Hg

specific gravity of mercury = 13.6

Calculate the higher calorific value of gas at S.T.P. (0°C and 760mm mercury)

(7marks)