POLITEKNIK
Jabatan Pengajian Politeknik

EXAMINATION AND EVALUATION DIVISION
DEPARTMENT OF POLYTECHNIC EDUCATION
(MINISTRY OF HIGHER EDUCATION)

MECHANICAL ENGINEERING DEPARTMENT

FINAL EXAMINATION
JUNE 2012 SESSION

J4100: PLANT ENGINEERING TECHNOLOGY

DATE: 24 NOVEMBER 2012(SATURDAY)
DURATION: 2 HOURS (2.30 PM -4.30 PM)

This paper consists of **FIVE (5)** pages including the front page.

Essay (6 questions – **answer 4** questions)

CONFIDENTIAL
DO NOT OPEN THIS QUESTION PAPER UNTIL INSTRUCTED BY THE CHIEF INVIGILATOR

STRUCTURED/ ESSAY (100 marks)

Instruction: This section consists of 6 structured/essay questions. Answer 4 questions only.

QUESTION 1

(a) State the function of a boiler.

(2 marks)

(b) List **THREE (3)** types of boiler mountings and **THREE (3)** types of accessories.

(3 marks)

(c) Distinguish **FOUR (4)** characteristics between a fire tube and a water tube boiler.

(8 marks)

(d) Sketch and label the equipment for a steam power plant listed below.

i. Economizer
ii. Super heater
iii. Air pre heater
iv. Feed water pump

(12 marks)

QUESTION 2

(a) State the level of steam pressure before and after entering a turbine.

(3 marks)

(b) Give **TWO (2)** advantages and **TWO (2)** disadvantages of steam turbine in comparison with a gas turbine.

(4 marks)

(c) Sketch and explain the operation of impulse steam turbine.

(8 marks)

(d) By using a suitable diagram, describe the velocity compounding for impulse steam turbine.

(10 marks)

QUESTION 3

(a) State the functions of compressed air plant equipment given below:

i. Filter

ii. Intercooler

iii. Water trapper

iv. Receiver

(4 marks)

(b) State the definition and function of a compressor.

(5 marks)

(c) Sketch the layout and label the equipment for a compressed air plant.

(6 marks)

(d) Sketch the centrifugal compressor and explain the basic working principles.

(10 marks)

QUESTION 4

(a) List **THREE (3)** advantages of a gas turbine plant in comparison with a steam power plant .Give **TWO (2)** examples of how a gas turbine engine is utilized.

(5 marks)

(b) State the main components in a gas turbine plant. State **THREE (3)** ways to increase the efficiencies of a gas turbine plant.

(6 marks)

(c) Sketch and label the schematic diagram for a gas turbine plant that consists of a compressor, three units of gas turbine, three units of combustion chamber and a generator.

(6 marks)

(d) By referring to 4(c), explain how this arrangement can increase the plant efficiency.

(8 marks)

QUESTION 5

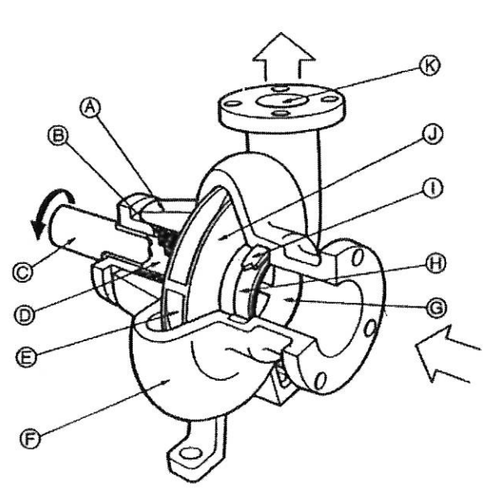

Figure 1

(a) Name the type of water pump shown in **Figure 1.**

(2 marks)

(b) List **SIX (6)** disadvantages of a reciprocating pump.

(6 marks)

(c) Explain the working principles of this pump in transferring water from a system.

(7 marks)

(d) A pump used for a power plant system has 10 cm^3/rev displacement is driven by a shaft at a speed of 1000 rev/min. It is subjected to a maximum pressure 125 bar. The volumetric efficiency is 0.7 and total efficiency for this system is 0.6. Calculate;

i. the pump flow rate

ii. the intake power of the pump

iii. the torque efficiency

iv. the torsion force in pump shaft

(10 marks)

QUESTION 6

(a) State **THREE (3)** advantages of a four-stroke engine in comparison with a two-stroke engine.

(3 marks)

(b) Sketch and label the components of a 2-stroke petrol engine.

(5 marks)

(c) State the functions of tools in an internal combustion engine system given below:

i. piston ring

ii. spark plug

iii. combustion chamber

(6 marks)

(d) In the 4-stroke petrol engine it is necessary to complete 4 cycles to generate power. Sketch and explain the operation of all strokes.

(11 marks)