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CONFIDENTIAL

SET B

UNIVERSITI KUALA LUMPUR

Malaysia France Institute

FINAL EXAMINATION

JANUARY 2011 SESSION

SUBJECT CODE	:	FRB 20102
SUBJECT TITLE	:	BASIC THERMODYNAMICS
LEVEL	:	BACHELOR
TIME/DURATION	:	9.00 am – 11.00 am (2 HOURS)
DATE	:	08 MAY 2011

INSTRUCTIONS TO CANDIDATES

1. All questions carry equal marks. Answer ANY FOUR (4) questions in English.
2. Please write your answers on the answer booklet provided.
3. Answer should be written in blue or black ink except for sketching, graphic and illustration.
4. This question paper consists one section only.
5. Answer all questions in English.

THERE ARE 3 PRINTED PAGES OF QUESTIONS EXCLUDING THIS PAGE.

INSTRUCTION: Answer ONLY FOUR (4) questions

Please use the answer booklet provided.

Question 1

A 0.5 m^3 vessel contains 10 kg of R-134a at -20°C. Determine:

(a) The pressure.

(8 marks)

(b) The total internal energy.

(8 marks)

(c) The volume occupied by the liquid.

(9 marks)

Question 2

2-kg of saturated liquid water at 150°C is heated at constant pressure in a piston-cylinder device until it becomes fully saturated vapour. Determine:

(a) The boundary work involved.

(10 marks)

(b) The amount of heat transfer involved.

(15 marks)

Question 3

An adiabatic air compressor is to be powered by a direct-coupled adiabatic steam turbine that is also driving a generator as in Figure Q3. Steam enters the turbine at 12.5 MPa and 500°C at a rate of 25 kg/s and exits at 10 kPa and a quality of 0.92. Air enters the compressor at 98 kPa and 295 K at a rate of 10 kg/s and exits at 1 MPa and 620 K. Determine:

(a) The final quality of the steam at the exit of the turbine.

(10 marks)

(b) The net work delivered by the turbine.

(15 marks)

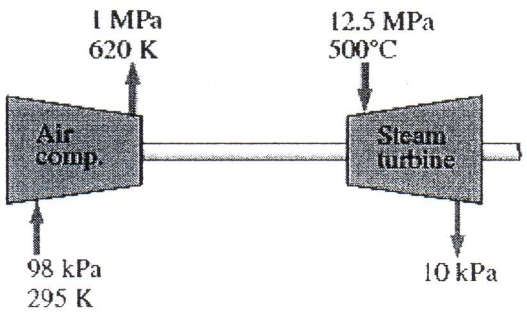

Figure Q3. Schematic of compressor and turbine.

Question 4

Steam enters an adiabatic turbine at 7 MPa, 600°C, and 80 m/s and leaves at 50 kPA, 150°C and 140 m/s. If the power output of the turbine is 6 MW, determine:

(a) The changes in kinetic energies of the steam through the turbine.

(8 marks)

(b) The mass flow rate of the steam through the turbine.

(8 marks)

(c) The isentropic efficiency of the turbine.

(9 marks)

Question 5

Argon gas enters an adiabatic turbine at 800°C and 1.5 MPa at a rate of 80 kg/min and exhaust at 200 kPa. If the power output of the turbine is 370 kW, determine:

(a) The exit temperature of the turbine if the process is reversible.

(10 marks)

(b) The isentropic efficiency of the turbine.

(15 marks)

END OF QUESTION