



UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

FIRST SEMESTER EXAMINATIONS, NOV/DEC 2018

COURSE NO: MC/EL/RN/MN 267
COURSE NAME: THERMODYNAMICS
CLASS: MC/EL/RN/MN II

TIME: 3 HOURS

Name: _____ Index Number: _____

INSTRUCTIONS

- Attempt **ALL** questions (marks for each is indicated beside each question).
- Full credits will be given to clear and logical presentation of solution. Whenever necessary, draw simple diagrams, state the principle or theory being applied, and/or assumptions made.
- Use a value of $g=9.81 \text{ m/s}^2$ for all acceleration due to gravity on earth.

SECTION A [35 MARKS]

1. Engineering thermodynamics does not include energy
 - a) Utilization
 - b) Storage
 - c) Transfer
 - d) Transformation
 - e) None of the above
2. Which of the following is not an extensive property?
 - a) Density
 - b) Kinetic energy
 - c) Mass
 - d) Momentum
 - e) None of the above
3. Which of the following is not an intensive property?
 - a) Volume
 - b) Temperature
 - c) Pressure
 - d) Velocity
 - e) None of the above
4. Which of the following is a quasi-equilibrium process?
 - a) Combustion
 - b) Compression of the air-fuel mixture in a cylinder
 - c) Mixing a fluid
 - d) A balloon bursting
 - e) None of the above
5. Which of the following is not an acceptable SI unit?
 - a) Pressure measured in newtons per square metre
 - b) Distance measured in centimetres
 - c) Volume measured in cubic centimetres
 - d) Density measured in grams per cubic centimetre
 - e) None of the above
6. A 120-V electric resistance heater draws 10 A. it operates for 10 minutes in a rigid volume. Calculate the work done on the air in the volume.
 - a) 720 000 kJ
 - b) 12 000 kJ
 - c) 720 kJ
 - d) 12 kJ
 - e) None of the above
7. Find the work if air expands from 0.2 m^3 to 0.8 m^3 while $p = (V + 2 V^2) \text{ kPa}$.
 - a) 0.72 kJ
 - b) 0.63 kJ
 - c) 0.36 kJ
 - d) 0.24 kJ
 - e) None of the above
8. Heat can be transferred by conduction through

SECTION B [25 MARKS]

1. A gas is contained in a closed system at a pressure of 1 bar and temperature of 15 °C. A mass of 0.9 kg of the gas is heated at constant pressure to raise its temperature from the initial temperature to a temperature of 250°C. Assuming the gas to be an ideal gas determine the work done in kJ, and during the process $R = 185 \text{ kJ/kgK}$. **[10 Marks]**
2. The mass flow rate into a steam turbine is 5400 kg/h and heat lost from the turbine is estimated to be 8.5 kW. The properties of the steam at inlet and outlet of the turbine are as follows:

	Inlet	Outlet
Temperature (°C)	420	99.6
Pressure (MPa)	2	0.1
Velocity (m/s)	200	80
Elevation (m)	3	6
Quality (%)	-	100

- a) What is the power output of this turbine in kW? **[10 Marks]**
- b) What is the diameter of both the inlet and outlet of the turbine? **[5 marks]**

Examiner: N. Yarkah