UNIVERSITY OF JOHANNESBURG

PROGRAM	:	BACHELOR OF ENGINEERING TECHNOLOGY *: INDUSTRIAL*
SUBJECT	:	**SUBJECT: THERMOFLUIDS 1B**
CODE	:	**THFMIB1**
DATE	:	SUPPLIMENTARYEXAMINATION 07 JANUARY 2020
DURATION	:	(SESSION 2) 11:30 - 14:30
WEIGHT	:	40 : 60
TOTAL MARKS	:	100
ASSESSOR	:	ASSESSOR: DR. D. KALLON
MODERATOR	:	MODERATOR: S. P. SIMELANE FILE NO: 2203
NUMBER OF PAGES	:	PAGES: 2 excluding the cover page plus Annexure 1.
INSTRUCTIONS	:	ONLY ONE POCKET CALCULATOR PER CANDIDATE MAY BE USED.

1. This paper contains 3 questions
2. PLEASE ANSWER **ALL** QUESTIONS
3. Make sure that you understand what the question requires before attempting it.
4. Any additional examination material is to be placed in the answer book and must indicate clearly the question number, and Student number.
5. Draw proper sketches where required with all relevant information
   Answers without calculations will not be considered.
   Answers without units will not be considered.
   All answers to be to the 4th decimal point.
   Number all answer according to the numbering in question paper.

REQUIREMENTS : Steam Property Tables; simple scientific calculators.

SECTION ONE: SHORT ANSWER QUESTIONS

QUESTION 1: SHORT ANSWER QUESTIONS [60 MARKS]

1.1 The basic barometer can be used to measure the height of a building. If the barometric readings at the top and at the bottom of a building are 730 and 755 mmHg, respectively, determine the height of the building. Assume an average air density of 1.18 kg/m^3. [10]

1.2 A rigid tank contrains saturated steam (with x = 1) at 0.1 MPa. Heat is added to the steam to increase it's pressure to 0.3 MPa. What is its final temparature ? [10]

1.3 Consider a 1200-kg car cruising steadily on a level road at 90 km/h. Now the car starts climbing a hill that is sloped 30° from the horizontal (see figure 1). If the velocity of the car is to remain constant during climbing, determine the additional power that must be delivered by the engine. [10]

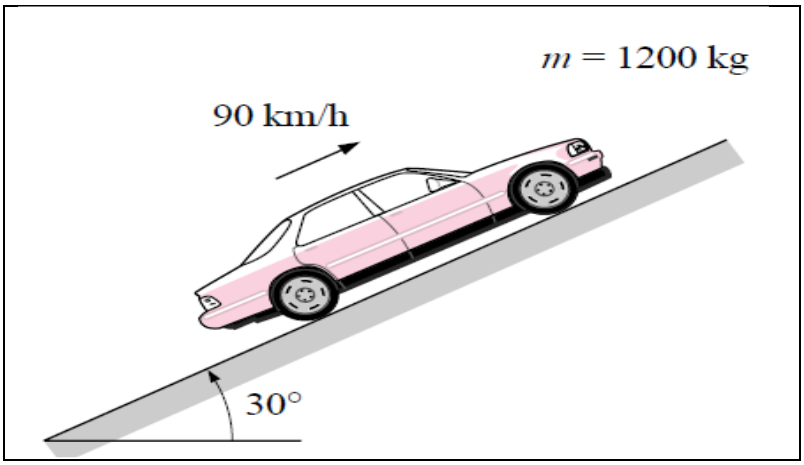

Figure 1

1.4 Determine the enthalpy of 1.5 kg of water contained in a volume of 1.2 m^3 at 200 kPa. [10]

1.5 A fluid contained in a 40-L tank has a weight of 300 N. Determine the mass and density of the fluid. [10]

1.6 A rigid tank contains air at 500 kPa and 150°C. As a result of heat transfer to the surroundings, the temperature and pressure inside the tank drop to 65°C and 400 kPa, respectively. Determine the boundary work done during this process. [10]

SECTION TWO: FLUID MECHANICS

QUESTION 2: BERNOULLI AND THE CONTINUITY EQUATION [20 MARKS]

Water is contained in a tank from which it can flow from its base through pipes that are at various diameters, as in figure 2. The height of the free surface at point 1 from point 2 is h = 4 m and the diameter of the pipes at points 2 and 3 are 0.5 m and 0.25 m respectively. If the free surface of the tank is open to the atmosphere, determine:

2.1 The Pressure Head. [8]

2.2 The Velocity Head. [8]

2.3 The Elevation Head. [4]

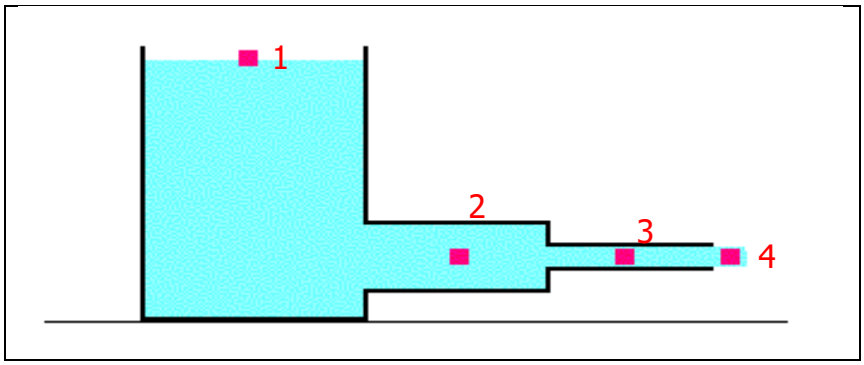

Figure 2

SECTION THREE: THERMODYNAMICS

QUESTION 3: PURE SUBSTANCES [20 MARKS]

A container holding 2 kg of the R-12 refrigerant is left outside a house overnight. If the overnight pressure was 0.1 MPa, determine:

3.1 The R-12 refrigerant temperature, assuming it is saturated. [12]

3.2 If the surrounding supplies heat at a rate of 1 kW, how long will it take for all the R-12 refrigerant to vaporise ? (8)

TOTAL = 100
