FINAL ALTERNATIVE ASSESSMENT

(COVER PAGE)

Session	:	**April 2021**
Programme	:	Diploma In Mechanical Engineering (DMEN)
Course	:	**EGM2181: Thermodynamics 2**
Date of Examination	:	26th July 2021 (Monday)
Time	:	12.00pm – 2.30pm Reading Time : Nil
Duration	:	2 Hours 30 Minutes

Special Instructions :

This paper consists of **FOUR (4)** questions. Answer **ALL** the questions. **Write ALL your answer** in the foolscap papers (you need to prepare your own papers)

Material permitted :

Non-Programmable Calculator

Materials provided :

Nil

Examiner(s)	:	**Soo Swee Yoong** and Nur Hafizah Habideen
Chief Moderator	:	Mohammad Faiz Osrin

*This paper consists of **3** printed pages, including the cover page*

DIPLOMA IN MECHANICAL ENGINEERING PROGRAMME (DMEN)
EGM2181: THERMODYNAMICS 2
FINAL ALTERNATIVE ASSESSMENT: APRIL 2021 SESSION

Instruction: This paper consists of **FOUR (4)** questions. Answer all **FOUR (4)** questions. All questions carry equal marks.

Question 1

A natural gas consists of the following volumetric composition

Nitrogen (N_2) 2%
Methane (CH_4) 92%
Ethane (C_2H_6) 4%
Propane (C_3H_8) 2%

For this gas, determine,

(a) The stoichiometric volume of air for the complete combustion of 1 m^3, (15 marks)

(b) The percentage volumetric analysis of the products of combustion. (10 marks)

(Total: 25 marks)

Question 2

An air-conditioning system is to take in outdoor air at 12°C and 40 percent relative humidity at a steady rate of 50 m^3/min, and to condition it to 26°C and 60 percent relative humidity. The outdoor air is first heated to 22°C in the heating section and then humidified by the injection of hot steam in the humidifying section. Assuming the entire process takes place at a pressure of 100 kPa, determine,

(a) The rate of heat supply in the heating section, (12 marks)

(b) The mass flow rate of the steam required in the humidifying section, (7 marks)

(c) Sketch and labelled, the schematic and psychrometric chart of the air-conditioning system mentioned above. (6 marks)

(Total: 25 marks)

Question 3

Consider a gas mixture that consists of 3 kg of O_2, 5 kg of N_2, and 12 kg of CH_4. Determine,

(a) The mass fraction of each component, (6 marks)

(b) The mole fraction of each component, (4 marks)

(c) The average molar mass and gas constant of the mixture. (15 marks)

(Total: 25 marks)

Question 4

A single-stage, single-acting, reciprocating air compressor has a bore of 200 mm and a stroke of 300 mm. It runs at a speed of 500 rev/min. The clearance volume is 5 percent of the swept volume and the polytropic index is 1.3 throughout. Intake pressure and temperature are 97 kPa and 20°C respectively, and the compression pressure is 550 kPa. With the aid of diagram and take free air conditions 101.325 kPa and 15°C, determine,

(a) The free air delivered in m^3/min, (12 marks)

(b) The volumetric efficiency referred to the free air conditions, (2 marks)

(c) The air delivery temperature, (3 marks)

(d) The cycle power, (4 marks)

(e) The isothermal efficiency, neglecting clearance. (4 marks)

(Total; 25 marks)

~ The End ~

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