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Course Code **AME003**



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech IV Semester CIE – II, MAY – 2018

Regulations: IARE-R16

THERMODYNAMICS

Time: 2 Hours

(AE)

Max Marks: 25

Answer all question from Part – A

Answer any four questions from Part – B

All parts of the question must be answered in one place only

PART – A

- (a) Explain the critical state of water. [BL: Remember | CO: 2 | Marks: 1]

(b) Derive the expression for internal energy. [BL: Understand | CO: 2 | Marks: 1]

(c) Explain adiabatic saturation temperature. [BL: Remember | CO: 7 | Marks: 1]

(d) What are the variable factors used for comparison of cycles?
[BL: Remember | CO: 9 | Marks: 1]

(e) Write the processes involved in brayton cycle. [BL: Understand | CO: 11 | Marks: 1]

PART – B

- (a) Compare the enthalpy, entropy and volume of steam at 1.4MPa and 380°C.
[BL: Understand | CO: 4 | Marks: 2]

(b) A certain gas has $C_p=1.968$ and $C_v=1.507$ kJ/kg K. Find its molecular weight and the gas constant.
[BL: Understand | CO: 4 | Marks: 3]
- (a) Compare the volumetric and gravimetric analysis of mixtures.
[BL: Understand | CO: 1 | Marks: 2]

(b) The analysis by weight of a perfect gas mixture at 20°C and 1.3 bar is 10% O_2 , 70% N_2 , 15% CO_2 and 5% CO. For a reference state of 0°C and 1bar, determine partial pressure of the constituent and gas constant of mixture.
[BL: Remember | CO: 1 | Marks: 3]
- (a) Explain the degree of saturation with an example. [BL: Understand | CO: 8 | Marks: 2]

(b) Find the relative humidity and specific humidity for air at 30°C and having dew point temperature of 15°C. Represent on psychrometric chart.
[BL: Understand | CO: 8 | Marks: 3]

5. (a) Derive an expression for air standard efficiency of dual cycle.
[BL: Understand | CO: 8 | Marks: 2]
- (b) An engine with 200mm cylinder diameter and 300mm stroke working on theoretical diesel cycle. The initial pressure and temperature of air used are 1bar and 270C. The cut of is 8% of the stroke. Determine air standard efficiency, mean effective pressure and power of the engine if the working cycles per minute are 300? Assume the compression ratio is 15 and the working fluid is air.
[BL: Understand | CO: 8 | Marks: 3]
6. (a) What is an air standard cycle? What are the limitations of air standard cycle? State the assumptions to be taken for its analysis.
[BL: Understand | CO: 11 | Marks: 2]
- (b) An air refrigeration open system operating between 1 M Pa and 100 k Pa is required to produce a cooling effect of 2000 kJ/min. Temperature of the air leaving the cold chamber is -5°C and at leaving the cooler is 30°C . Neglect losses and clearance in the compressor and expander. Determine
[BL: Understand | CO: 11 | Marks: 3]
- i) Mass of air circulated per min.
 - ii) Compressor work, expander work, and cycle work
 - iii) COP and power in kW required