Code No: R05222103 **R05** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
THERMODYNAMICS
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) For the same compression ratio, show that the efficiency of Otto cycle is greater thanthat of Diesel cycle.
   (b) What is meant by Hot air Engine? Which air-standard cycle is used in studying an Hot air engine? Explain it in detail. [6+10]

2. (a) Deduce the relationship between absolute temperature and absolute pressure in an adiabatic process.
   (b) 1.5 kg of air at pressure 6 bar occupies a volume of $0.2m^3$.If this air is expanded to a volume of $1.1m^3$. Find the work done and heat absorbed or rejected by the air for each of the following methods of trying one the process.
      i. isothermally
      ii. Adiabatic ally [7+9]

3. (a) Water vapour mixture at 100^0C is contained in a rigid vessel of $0.5m^3$ capacity water is now heated till it reaches critical state. What was the mass and volume of water initially?
   (b) Steam turbine expands steam reversibly and adiabatic ally from 4mpa, 300^0Cto50^0Cat turbine exit, determine the work output per kg of steam. [8+8]

4. A mixture of ideal gases consists of 3 kg of Nitrogen and 5 kg of carbon dioxide at a pressure of 4 bar and temperature of 25^0 C .Find
   (a) mole fraction of each constituent
   (b) equivalent molecular weight of the mixture
   (c) Equivalent gas constant of the mixture
   (d) Partial pressure and partial volumes
   (e) volume and density of the mixture
   (f) C_p&C_v of the mixture. [16]

5. A mass of 6.98 kg of air is in a vessel at 200 KPa, 27^0C. Heat is transferred to the air from a reservoir at 727^0C until the temperature of air rises to 327^0C. The environment is at 100 KPa, 17^0C. Determine
   (a) the inial and final availability
   (b) the maximum useful work associated with the process. For air Cv = 0.718 KJ/Kg-K and R = 0.287 KJ/Kg-K. [16]

6. A refrigerating machine employing CO_2 works between the evaporator and cooler temps of -5^0C and 25^0C.During suction $CO_2$is 0.6 dry. How many tones of ice the machine will make per day if relative C.O.P is 40%. water supplied for making ice is at 10^0C. The compressor takes 6 kg of CO_2per minute.
$L_{ice} = 336kJ/kg.$
$C_{pw} = 4.2kJ/kg$

   Properties of CO_2 [16]

t^0C	h kJ/kg	LkJ/kg	φ_1 kJ/kg.K
25^0	81.50	121.80	0.252
-5^0	-7.56	246.12	-0.042

7. (a) Explain the terms system, surroundings and boundary.
   (b) When the valve of the evacuated bottle is opened, atmospheric air rushes into it. If the atmospheric pressure is 101.325 kpa and 0.6 m^3 of air enters into the bottle, calculate the work done by air.
   (c) What are exact and inexact differentials? [6+6+4]

8. A gas flows steadily through a rotary compressor. The gas enters the compressor at a temperature of 16^0C, a pressure of 100 KPa, and an enthalpy of 391.2 KJ/Kg. The gas leaves the compressor at a temperature of 245^0C, a pressure of 0.6 MPa, and an enthalpy of 534.5 KJ/Kg. There is no heat transfer between the system and surroundings.
   (a) Evaluate the external work done per unit mass of gas assuming the gas velocities at entry and exit to be negligible.
   (b) Evaluate the external work done per unit mass of gas when the gas velocity at entry is 80 m/s and that at exit is 160 m/s. [16]

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Code No: R05222103 **R05** **Set No. 4**

II B.Tech II Semester Examinations,December 2010
THERMODYNAMICS
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Deduce the relationship between absolute temperature and absolute pressure in an adiabatic process.
   (b) 1.5 kg of air at pressure 6 bar occupies a volume of $0.2m^3$.If this air is expanded to a volume of $1.1m^3$. Find the work done and heat absorbed or rejected by the air for each of the following methods of trying one the process.
      i. isothermally
      ii. Adiabatic ally [7+9]

2. (a) Explain the terms system, surroundings and boundary.
   (b) When the valve of the evacuated bottle is opened, atmospheric air rushes into it. If the atmospheric pressure is 101.325 kpa and 0.6 m^3 of air enters into the bottle, calculate the work done by air.
   (c) What are exact and inexact differentials? [6+6+4]

3. (a) Water vapour mixture at 100^0C is contained in a rigid vessel of $0.5m^3$ capacity water is now heated till it reaches critical state. What was the mass and volume of water initially?
   (b) Steam turbine expands steam reversibly and adiabatic ally from 4mpa, 300^0Cto50^0Cat turbine exit, determine the work output per kg of steam. [8+8]

4. A refrigerating machine employing CO_2 works between the evaporator and cooler temps of -5^0C and 25^0C.During suction $CO_2$is 0.6 dry. How many tones of ice the machine will make per day if relative C.O.P is 40%. water supplied for making ice is at 10^0C. The compressor takes 6 kg of CO_2per minute.
   $L_{ice} = 336kJ/kg.$
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   Properties of CO_2 [16]

t^0C	h kJ/kg	LkJ/kg	φ_1 kJ/kg.K
25^0	81.50	121.80	0.252
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(a) Evaluate the external work done per unit mass of gas assuming the gas velocities at entry and exit to be negligible.

(b) Evaluate the external work done per unit mass of gas when the gas velocity at entry is 80 m/s and that at exit is 160 m/s. [16]

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(b) equivalent molecular weight of the mixture

(c) Equivalent gas constant of the mixture

(d) Partial pressure and partial volumes

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Code No: R05222103 **R05** **Set No. 1**

II B.Tech II Semester Examinations,December 2010
THERMODYNAMICS
Aeronautical Engineering

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4. (a) Explain the terms system, surroundings and boundary.
   (b) When the valve of the evacuated bottle is opened, atmospheric air rushes into it. If the atmospheric pressure is 101.325 kpa and 0.6 m^3 of air enters into the bottle, calculate the work done by air.
   (c) What are exact and inexact differentials? [6+6+4]

5. (a) Deduce the relationship between absolute temperature and absolute pressure in an adiabatic process.

(b) 1.5 kg of air at pressure 6 bar occupies a volume of $0.2m^3$.If this air is expanded to a volume of $1.1m^3$. Find the work done and heat absorbed or rejected by the air for each of the following methods of trying one the process.

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II B.Tech II Semester Examinations,December 2010
THERMODYNAMICS
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

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