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

II B.Tech II Semester Examinations,APRIL 2011
THERMODYNAMICS
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Derive an expression for heat transfer in a non-flow constant volume process.
   (b) A spherical shaped of 14 M diameter contain 'H_2' at 33^0C and 1.3 bar. Find the mass of 'H_2' in the balloon using real gas equation. [7+9]

2. In an ammonia vapour compression system, the pressure in the evaporator is 2 bar. Ammonia at exit is 0.85 dry and at entry its dryness fraction is 0.19. During compression, the work done per kg of ammonia is 150kJ. Calculate the C.O.P and volume of vapour entering the compressor per minute, if the rate of ammonia circulation is 4.5kg/min. the latent heat and specific volume at 2 bar are 1325kJ/kg and $0.58m^3$/kg respectively. [16]

3. (a) Write the differences between system and control volume.
   (b) A gas undergoes a reversible non-flow process according to the relation P = (-3V+15)where V is the volume in m^3 and P is the pressure in bar. Determine the work done when the volume changes from 3 to 6 m^3. [6+10]

4. A gas undergoes a thermodynamic cycle consisting of the following processes:
   (a) Process 1-2: Constant pressure, P=1.4 bar, V1 = 0.028 m^3, W_{12} = 10.5 KJ,
   (b) Process 2-3 compression with PV = constant, U_3= U_2,
   (c) Process 3-1: Constant volume, U_1 - U_3 = -26.4 KJ.

   There are no significant changes in KE and PE.
   (a) sketch the cycle on a P-V diagram
   (b) Calculate the net work for the cycle in KJ
   (c) calculate the heat transfer for process 1-2
   (d) show that $\oint \delta Q = \oint \delta W$. [16]

5. Draw T-s and p-V diagrams of a Otto cycle. Derive an expression for the air standard efficiency of Otto cycle in terms of compression ratio and net work down per kg of air. [16]

6. (a) Explain the influence of pressure on the following properties of steam preferably with the help of T-S diagram. 1. Enthalpy of evaporation 2. Enthalpy of dry saturated steam.
   (b) 5kg of steam with a dryness fraction of 0.9 expand adiabatically according to the law $PV^{1.13}$ = C from a pressure of 8 bar to 1.5 bar. Determine 1. Final dryness fraction 2. Heat transferred 3. Work done. [7+9]

7. (a) Explain

i. Dry bulb temperature
ii. Wet bulb depression.

(b) Air $(N_2 = 77\%, O_2 = 23\% by weight) at 27^0$C and 13 bar is contained in a vessel of capacity $0.6m^3$.Some quantity of CO_2 is forced into the vessel so that the temperature remains at 27^0C but the pressure rises to 19 bar. Find the masses of $O_2, N_2 and CO_2$ in the cylinder. [6+10]

8. Two reversible heat engines A and B are arranged in series. Engine A rejects heat directly to engine B. A receives 200 KJ at a temperature of 421^0C from the hot source while engine B is in communication with a cold sink at a temperature of5^0C. If the work output of A is twice that of B find

   (a) intermediate temperature between A and B and
   (b) efficiency of each engine. [16]

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

II B.Tech II Semester Examinations,APRIL 2011
THERMODYNAMICS
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain
   i. Dry bulb temperature
   ii. Wet bulb depression.
   (b) Air $(N_2 = 77\%, O_2 = 23\% by weight) at 27^0$C and 13 bar is contained in a vessel of capacity $0.6m^3$.Some quantity of CO_2 is forced into the vessel so that the temperature remains at 27^0C but the pressure rises to 19 bar. Find the masses of $O_2, N_2 and CO_2$ in the cylinder. [6+10]

2. (a) Derive an expression for heat transfer in a non-flow constant volume process.
   (b) A spherical shaped of 14 M diameter contain 'H_2' at 33^0C and 1.3 bar. Find the mass of 'H_2' in the balloon using real gas equation. [7+9]

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   (a) intermediate temperature between A and B and
   (b) efficiency of each engine. [16]

4. (a) Write the differences between system and control volume.
   (b) A gas undergoes a reversible non-flow process according to the relation P = (-3V+15)where V is the volume in m^3 and P is the pressure in bar. Determine the work done when the volume changes from 3 to 6 m^3. [6+10]

5. A gas undergoes a thermodynamic cycle consisting of the following processes:
   (a) Process 1-2: Constant pressure, P=1.4 bar, V1 = 0.028 m^3, W_{12} = 10.5 KJ,
   (b) Process 2-3 compression with PV = constant, U_3= U_2,
   (c) Process 3-1: Constant volume, U_1 - U_3 = -26.4 KJ.

   There are no significant changes in KE and PE.
   (a) sketch the cycle on a P-V diagram
   (b) Calculate the net work for the cycle in KJ
   (c) calculate the heat transfer for process 1-2
   (d) show that $\oint \delta Q = \oint \delta W$. [16]

6. (a) Explain the influence of pressure on the following properties of steam preferably with the help of T-S diagram. 1. Enthalpy of evaporation 2. Enthalpy of dry saturated steam.

   (b) 5kg of steam with a dryness fraction of 0.9 expand adiabatically according to the law $PV^{1.13} = C$ from a pressure of 8 bar to 1.5 bar. Determine 1. Final dryness fraction 2. Heat transferred 3. Work done. [7+9]

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8. Draw T-s and p-V diagrams of a Otto cycle. Derive an expression for the air standard efficiency of Otto cycle in terms of compression ratio and net work down per kg of air. [16]

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

II B.Tech II Semester Examinations,APRIL 2011
THERMODYNAMICS
Aeronautical Engineering

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

Answer any FIVE Questions
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   i. Dry bulb temperature
   ii. Wet bulb depression.

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2. (a) Derive an expression for heat transfer in a non-flow constant volume process.

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   There are no significant changes in KE and PE.

   (a) sketch the cycle on a P-V diagram

   (b) Calculate the net work for the cycle in KJ

   (c) calculate the heat transfer for process 1-2

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Code No: R05222103 **R05** **Set No. 3**

II B.Tech II Semester Examinations,APRIL 2011
THERMODYNAMICS
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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3. Draw T-s and p-V diagrams of a Otto cycle. Derive an expression for the air standard efficiency of Otto cycle in terms of compression ratio and net work down per kg of air. [16]

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   (a) Process 1-2: Constant pressure, P=1.4 bar, V1 = 0.028 m^3, W_{12} = 10.5 KJ,
   (b) Process 2-3 compression with PV = constant, U_3= U_2,
   (c) Process 3-1: Constant volume, U_1 - U_3 = -26.4 KJ.

   There are no significant changes in KE and PE.
   (a) sketch the cycle on a P-V diagram
   (b) Calculate the net work for the cycle in KJ
   (c) calculate the heat transfer for process 1-2
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