Code No: 07A3EC08 **R07** **Set No. 2**

II B.Tech I Semester Examinations,MAY 2011
THERMODYNAMICS
Common to Mechanical Engineering, Aeronautical Engineering, Automobile Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are the advantages associated with the diesel cycle as compared to the otto cycle?
   (b) A gas engine working on Otto cycle has a cylinder of diameter 220 mm and stroke 300 mm. The clearance volume is 1800 cc. Find the air-standard efficiency. Assume C_p =1.004 kJ/kg.K and C_v = 0.718 kJ/kg.K for air. [6+10]

2. (a) Explain with a neat sketch P-V-T diagram.
   (b) 2 kg of steam expands adiabatically from 20 bar, 300^0C to 0.5 bar in a steam turbine such that the steam is dry and saturated at the end of expansion. Calculate
      i. the work done by steam, and
      ii. work lost due to irreversibility. [8+8]

3. (a) What is an equation of state?
   (b) Air at 16^0C and 1.02 bar occupies a volume of 0.03 m^3. The air is heated at constant volume until the pressure is 4.3 bar and then cooled at constant pressure back to the original temperature. calculate
      i. The net heat flow to or from the air and
      ii. The net entropy change. [6+10]

4. (a) Explain with neat sketch the working of vapour compression refrigeration cycle
   (b) Describe a binary vapour cycle with the help of schematic diagram of the plant and T-S diagram of the cycle. [8+8]

5. An engine working on Carnot cycle absorbs Q_1 units of heat from a source at T_1 and rejects Q_2 units of heat to a sink at T_2. Te temperature of the working fluid is θ_1 and θ_2, where $\theta_1 < T_1$ and $\theta_2 > T_2$,
   If $\theta_1 = T_1$-KQ_1 and $\theta_2 = T_2$+kQ_2
   where k is constant, then show that efficiency of the engine is given by:
   $\eta = 1 - \frac{T_2}{T_1 - 2kQ_1}$. [16]

6. (a) Derive steady flow energy equation and simplify the equation when applied to
      i. Gas turbine
      ii. Compressors

(b) A fluid system under goes a non-flow frictionless process following the pressure volume relation as p=5/v +1.5 where p is in bar and v is in m^3 and the system rejects 42 kj of heat. Determine

i. change in internal energy

ii. change in enthalpy. [8+8]

7. (a) Describe the method of dehumidification by cooling and show it on psychrometric chart. Derive energy equation for this process.

(b) A thermally insulated vessel contains 3 kg mole of H_2 and 1.5 kg mole of N_2 each at 1 bar 27^0C initially they are separated by a partition wall. Determine the change in entropy when the partition wall is removed and the two gases mixes. [8+8]

8. (a) What are the different types of thermodynamic systems? Explain with examples.

(b) Work done by a substance in a reversible non-flow manner is in accordance with $= \left(\frac{150}{p}\right) m^3$, where p is in bar. Evaluate the work done on or by the system as pressure increases from 10 to 100 bar. Indicate whether it is a compression or expansion process. [8+8]

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Code No: 07A3EC08 **R07** **Set No. 4**

II B.Tech I Semester Examinations,MAY 2011
THERMODYNAMICS
Common to Mechanical Engineering, Aeronautical Engineering, Automobile Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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2. (a) Explain with neat sketch the working of vapour compression refrigeration cycle
   (b) Describe a binary vapour cycle with the help of schematic diagram of the plant and T-S diagram of the cycle. [8+8]

3. (a) What are the different types of thermodynamic systems? Explain with examples.
   (b) Work done by a substance in a reversible non-flow manner is in accordance with $= \left(\frac{150}{p}\right) m^3$, where p is in bar. Evaluate the work done on or by the system as pressure increases from 10 to 100 bar. Indicate whether it is a compression or expansion process. [8+8]

4. (a) What is an equation of state?
   (b) Air at 16^0C and 1.02 bar occupies a volume of 0.03 m^3. The air is heated at constant volume until the pressure is 4.3 bar and then cooled at constant pressure back to the original temperature. calculate
      i. The net heat flow to or from the air and
      ii. The net entropy change. [6+10]

5. (a) Derive steady flow energy equation and simplify the equation when applied to
      i. Gas turbine
      ii. Compressors
   (b) A fluid system under goes a non-flow frictionless process following the pressure volume relation as p=5/v +1.5 where p is in bar and v is in m^3 and the system rejects 42 kj of heat. Determine
      i. change in internal energy
      ii. change in enthalpy. [8+8]

6. An engine working on Carnot cycle absorbs Q_1 units of heat from a source at T_1 and rejects Q_2 units of heat to a sink at T_2. Te temperature of the working fluid is θ_1 and θ_2, where $\theta_1 < T_1$ and $\theta_2 > T_2$,
If $\theta_1 = T_1$-KQ_1 and $\theta_2 = T_2$+kQ_2
where k is constant, then show that efficiency of the engine is given by:
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8. (a) Explain with a neat sketch P-V-T diagram.

   (b) 2 kg of steam expands adiabatically from 20 bar, 300^0C to 0.5 bar in a steam turbine such that the steam is dry and saturated at the end of expansion. Calculate

      i. the work done by steam, and
      ii. work lost due to irreversibility. [8+8]

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Code No: 07A3EC08 **R07** **Set No. 1**

II B.Tech I Semester Examinations,MAY 2011
THERMODYNAMICS
Common to Mechanical Engineering, Aeronautical Engineering, Automobile Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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   (b) A gas engine working on Otto cycle has a cylinder of diameter 220 mm and stroke 300 mm. The clearance volume is 1800 cc. Find the air-standard efficiency. Assume C_p =1.004 kJ/kg.K and C_v = 0.718 kJ/kg.K for air. [6+10]

4. (a) Explain with neat sketch the working of vapour compression refrigeration cycle
   (b) Describe a binary vapour cycle with the help of schematic diagram of the plant and T-S diagram of the cycle. [8+8]

5. (a) What are the different types of thermodynamic systems? Explain with examples.
   (b) Work done by a substance in a reversible non-flow manner is in accordance with $= \left(\frac{150}{p}\right) m^3$, where p is in bar. Evaluate the work done on or by the system as pressure increases from 10 to 100 bar. Indicate whether it is a compression or expansion process. [8+8]

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7. (a) Derive steady flow energy equation and simplify the equation when applied to
   i. Gas turbine
   ii. Compressors
   (b) A fluid system under goes a non-flow frictionless process following the pressure volume relation as p=5/v +1.5 where p is in bar and v is in m^3 and the system rejects 42 kj of heat. Determine
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   ii. change in enthalpy. [8+8]

8. (a) Explain with a neat sketch P-V-T diagram.
   (b) 2 kg of steam expands adiabatically from 20 bar, 300^0C to 0.5 bar in a steam turbine such that the steam is dry and saturated at the end of expansion. Calculate
   i. the work done by steam, and
   ii. work lost due to irreversibility. [8+8]

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Code No: 07A3EC08 **R07** **Set No. 3**

II B.Tech I Semester Examinations,MAY 2011
THERMODYNAMICS
Common to Mechanical Engineering, Aeronautical Engineering, Automobile Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are the different types of thermodynamic systems? Explain with examples.
   (b) Work done by a substance in a reversible non-flow manner is in accordance with $= \left(\frac{150}{p}\right) m^3$, where p is in bar. Evaluate the work done on or by the system as pressure increases from 10 to 100 bar. Indicate whether it is a compression or expansion process. [8+8]

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      i. The net heat flow to or from the air and
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4. (a) Explain with a neat sketch P-V-T diagram.
   (b) 2 kg of steam expands adiabatically from 20 bar, 300^0C to 0.5 bar in a steam turbine such that the steam is dry and saturated at the end of expansion. Calculate
      i. the work done by steam, and
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5. (a) Derive steady flow energy equation and simplify the equation when applied to
      i. Gas turbine
      ii. Compressors
   (b) A fluid system under goes a non-flow frictionless process following the pressure volume relation as p=5/v +1.5 where p is in bar and v is in m^3 and the system rejects 42 kj of heat. Determine
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   (b) Describe a binary vapour cycle with the help of schematic diagram of the plant and T-S diagram of the cycle. [8+8]

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