Code No: R05210304 **R05** **Set No. 2**

II B.Tech I Semester Examinations,November 2010
THERMODYNAMICS
Common to Mechanical Engineering, Automobile Engineering
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the important components of a simple vapour compression refrigeration system. Also discuss the functions of each component.
   (b) Discuss the effect of sub cooling on C.O.P.of the vapour compression refrigeration cycle. Would you derive large sub cooling and why? [8+8]

2. (a) Deduce the relation ship between absolute temperature and pressure in an polytropic process.
   (b) $0.3m^3$ of air at pressure 8 bars expands to $1.5m^3$. The final pressure is 1.3 bar. Assuming the expansion to be polytropic, calculate the heat supplied and change of internal energy. Take γ= 1.4 [7+9]

3. A cycle consists of three processes. The first is a constant pressure compression at 200 KPa from an initial volume of 0.7 m^3 to a final volume of 0.2 m^3. The second process takes place at constant volume with the pressure increasing to 600 KPa. The third process to the beginning of the first process. Sketch the cycle on P-v coordinates, and calculate the net work transfer. [16]

4. (a) Make an energy analysis of the steam nozzle and heat exchanger.
   (b) Refrigerant vapour enters the condenser of a refrigeration plant with enthalpy 223.75 KJ/kg and leaves with enthalpy 64.6 KJ/kg. Cooling water enters at 15^0C and leaves at 20^0C. Calculate the mass flow rate of water per unit flow rate of refrigerant. Take for water Cp = 4.186 KJ/Kg-K. [8+8]

5. (a) List out different colorimeters used to find the quality of wet steam, Explain any one of them.
   (b) In a steam engine the steam at the beginning of the expansion process is at 7 bar, dryness fraction 0.98 and expansion follows the low $Pv^{1.1}$ = constant ,down to a pressure of 0.34 bar, calculate The work done during expansion per kg of steam. [7+9]

6. (a) State the Kelvin-Plank and Clausius statements of the second law of thermodynamics and establish equivalence between them.
   (b) Determine the power required to run a refrigerator that transfers 2000 KJ/min of heat from a cooled space at 0^0C to the surrounding atmosphere at 27^0C. The refrigerator operates on reversed Carnot cycle. [10+6]

7. An engine with 200mm cylinder diameter and 300mm stroke works on diesel cycle. The initial pressure and temperature of air used are 1 bar and 27^0C. The cut-off is 8% of the stroke. Determine:

(a) Temperatures and pressures at all salient points

(b) Air standard efficiency. [16]

8. (a) Write shoot notes on

i. By pass factor

ii. Degree of saturation

iii. Adiabatic mixing

iv. Humidification

(b) $200m^3$ of air per minute at 15^0C DBT and 75 Find

i. R. it of heated air

ii. Wet bulb temperature of heated air

iii. Heat added to air per minute [8+8]

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Code No: R05210304 **R05** **Set No. 4**

II B.Tech I Semester Examinations,November 2010
THERMODYNAMICS
Common to Mechanical Engineering, Automobile Engineering
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. An engine with 200mm cylinder diameter and 300mm stroke works on diesel cycle. The initial pressure and temperature of air used are 1 bar and 27^0C. The cut-off is 8% of the stroke. Determine:
   (a) Temperatures and pressures at all salient points
   (b) Air standard efficiency. [16]

2. (a) Explain the important components of a simple vapour compression refrigeration system. Also discuss the functions of each component.
   (b) Discuss the effect of sub cooling on C.O.P.of the vapour compression refrigeration cycle. Would you derive large sub cooling and why? [8+8]

3. (a) List out different colorimeters used to find the quality of wet steam, Explain any one of them.
   (b) In a steam engine the steam at the beginning of the expansion process is at 7 bar, dryness fraction 0.98 and expansion follows the low $Pv^{1.1}$ = constant ,down to a pressure of 0.34 bar, calculate The work done during expansion per kg of steam. [7+9]

4. (a) Make an energy analysis of the steam nozzle and heat exchanger.
   (b) Refrigerant vapour enters the condenser of a refrigeration plant with enthalpy 223.75 KJ/kg and leaves with enthalpy 64.6 KJ/kg. Cooling water enters at 15^0C and leaves at 20^0C. Calculate the mass flow rate of water per unit flow rate of refrigerant. Take for water Cp = 4.186 KJ/Kg-K. [8+8]

5. (a) Deduce the relation ship between absolute temperature and pressure in an polytropic process.
   (b) $0.3m^3$ of air at pressure 8 bars expands to $1.5m^3$. The final pressure is 1.3 bar. Assuming the expansion to be polytropic, calculate the heat supplied and change of internal energy. Take γ= 1.4 [7+9]

6. A cycle consists of three processes. The first is a constant pressure compression at 200 KPa from an initial volume of 0.7 m^3 to a final volume of 0.2 m^3. The second process takes place at constant volume with the pressure increasing to 600 KPa. The third process to the beginning of the first process. Sketch the cycle on P-v coordinates, and calculate the net work transfer. [16]

7. (a) Write shoot notes on

i. By pass factor
ii. Degree of saturation
iii. Adiabatic mixing
iv. Humidification

(b) $200m^3$ of air per minute at 15^0C DBT and 75 Find

i. R. it of heated air
ii. Wet bulb temperature of heated air
iii. Heat added to air per minute [8+8]

8. (a) State the Kelvin-Plank and Clausius statements of the second law of thermodynamics and establish equivalence between them.

(b) Determine the power required to run a refrigerator that transfers 2000 KJ/min of heat from a cooled space at 0^0C to the surrounding atmosphere at 27^0C. The refrigerator operates on reversed Carnot cycle. [10+6]

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Code No: R05210304 **R05** **Set No. 1**

II B.Tech I Semester Examinations,November 2010
THERMODYNAMICS
Common to Mechanical Engineering, Automobile Engineering
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Deduce the relation ship between absolute temperature and pressure in an polytropic process.
   (b) $0.3m^3$ of air at pressure 8 bars expands to $1.5m^3$. The final pressure is 1.3 bar. Assuming the expansion to be polytropic, calculate the heat supplied and change of internal energy. Take γ= 1.4 [7+9]

2. (a) Explain the important components of a simple vapour compression refrigeration system. Also discuss the functions of each component.
   (b) Discuss the effect of sub cooling on C.O.P.of the vapour compression refrigeration cycle. Would you derive large sub cooling and why? [8+8]

3. A cycle consists of three processes. The first is a constant pressure compression at 200 KPa from an initial volume of 0.7 m^3 to a final volume of 0.2 m^3. The second process takes place at constant volume with the pressure increasing to 600 KPa. The third process to the beginning of the first process. Sketch the cycle on P-v coordinates, and calculate the net work transfer. [16]

4. (a) Make an energy analysis of the steam nozzle and heat exchanger.
   (b) Refrigerant vapour enters the condenser of a refrigeration plant with enthalpy 223.75 KJ/kg and leaves with enthalpy 64.6 KJ/kg. Cooling water enters at 15^0C and leaves at 20^0C. Calculate the mass flow rate of water per unit flow rate of refrigerant. Take for water Cp = 4.186 KJ/Kg-K. [8+8]

5. (a) State the Kelvin-Plank and Clausius statements of the second law of thermodynamics and establish equivalence between them.
   (b) Determine the power required to run a refrigerator that transfers 2000 KJ/min of heat from a cooled space at 0^0C to the surrounding atmosphere at 27^0C. The refrigerator operates on reversed Carnot cycle. [10+6]

6. (a) Write shoot notes on
      i. By pass factor
      ii. Degree of saturation
      iii. Adiabatic mixing
      iv. Humidification
   (b) $200m^3$ of air per minute at 15^0C DBT and 75 Find
      i. R. it of heated air

ii. Wet bulb temperature of heated air

iii. Heat added to air per minute [8+8]

7. (a) List out different colorimeters used to find the quality of wet steam, Explain any one of them.

   (b) In a steam engine the steam at the beginning of the expansion process is at 7 bar, dryness fraction 0.98 and expansion follows the low $Pv^{1.1}$ = constant ,down to a pressure of 0.34 bar, calculate The work done during expansion per kg of steam. [7+9]

8. An engine with 200mm cylinder diameter and 300mm stroke works on diesel cycle. The initial pressure and temperature of air used are 1 bar and 27^0C. The cut-off is 8% of the stroke. Determine:

   (a) Temperatures and pressures at all salient points

   (b) Air standard efficiency. [16]

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Code No: R05210304 **R05** **Set No. 3**

II B.Tech I Semester Examinations,November 2010
THERMODYNAMICS
Common to Mechanical Engineering, Automobile Engineering
Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) State the Kelvin-Plank and Clausius statements of the second law of thermodynamics and establish equivalence between them.
   (b) Determine the power required to run a refrigerator that transfers 2000 KJ/min of heat from a cooled space at 0^0C to the surrounding atmosphere at 27^0C. The refrigerator operates on reversed Carnot cycle. [10+6]

2. An engine with 200mm cylinder diameter and 300mm stroke works on diesel cycle. The initial pressure and temperature of air used are 1 bar and 27^0C. The cut-off is 8% of the stroke. Determine:
   (a) Temperatures and pressures at all salient points
   (b) Air standard efficiency. [16]

3. (a) List out different colorimeters used to find the quality of wet steam, Explain any one of them.
   (b) In a steam engine the steam at the beginning of the expansion process is at 7 bar, dryness fraction 0.98 and expansion follows the low $Pv^{1.1}$ = constant ,down to a pressure of 0.34 bar, calculate The work done during expansion per kg of steam. [7+9]

4. (a) Deduce the relation ship between absolute temperature and pressure in an polytropic process.
   (b) $0.3m^3$ of air at pressure 8 bars expands to $1.5m^3$. The final pressure is 1.3 bar. Assuming the expansion to be polytropic, calculate the heat supplied and change of internal energy. Take γ= 1.4 [7+9]

5. (a) Make an energy analysis of the steam nozzle and heat exchanger.
   (b) Refrigerant vapour enters the condenser of a refrigeration plant with enthalpy 223.75 KJ/kg and leaves with enthalpy 64.6 KJ/kg. Cooling water enters at 15^0C and leaves at 20^0C. Calculate the mass flow rate of water per unit flow rate of refrigerant. Take for water Cp = 4.186 KJ/Kg-K. [8+8]

6. (a) Explain the important components of a simple vapour compression refrigeration system. Also discuss the functions of each component.
   (b) Discuss the effect of sub cooling on C.O.P.of the vapour compression refrigeration cycle. Would you derive large sub cooling and why? [8+8]

7. (a) Write shoot notes on

i. By pass factor
ii. Degree of saturation
iii. Adiabatic mixing
iv. Humidification

(b) $200m^3$ of air per minute at 15^0C DBT and 75 Find
i. R. it of heated air
ii. Wet bulb temperature of heated air
iii. Heat added to air per minute [8+8]

8. A cycle consists of three processes. The first is a constant pressure compression at 200 KPa from an initial volume of 0.7 m^3 to a final volume of 0.2 m^3. The second process takes place at constant volume with the pressure increasing to 600 KPa. The third process to the beginning of the first process. Sketch the cycle on P-v coordinates, and calculate the net work transfer. [16]

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