Code No: RR210304 **RR** **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. One kg of gas at pressure $825 KN/m^2$ and temperature 327^0C expands to pressure $90 KN/m^2$ until the volume becomes five times the initial volume according to the law pv^n = C. Determine
   (a) the value of index
   (b) Work done
   (c) Heat transferred
   (d) Change in internal energy. [16]
2. Starting from first law and using second law derive the Gibb's equations and hence deduce the Maxwell's relations. [16]
3. Air has a dry bulb temperature of 27^0C and a wet bulb temperature of 20^0C. If the barometer reads 1 bar, Calculate
   (a) the humidity ratio
   (b) the relative humidity
   (c) the dew point
   (d) the enthalpy of mixture per kg of dry air. [16]
4. A simple saturation cycle using R-22 is designed for a load of 100 TR. The saturated suction and discharge temperatures are 5^0C and 40^0C respectively. Calculate
   (a) The mass flow rate of refrigerant
   (b) The C.O.P. and isentropic horsepower.
   (c) The heat rejected in the condenser. Use the following data:

t	P	h_l	h_g	S_l	S_g	v_g
^{0}C	bar	KJ/Kg	KJ/Kg	KJ/Kg K	KJ/Kg K	m^3/Kg
5	5.836	205.9	407.1	1.02115	1.7447	0.0404
40	15.331	249.53	416.4	1.16659	1.69953	

   Specific heat of vapor is 0.65 KJ/Kg K. [16]

5. (a) Define mean effective pressure. What is its importance in reciprocating engines.
   (b) A diesel cycle operating on an air standard cycle has a compression ratio at 15. The pressure and temperature at the beginning of the compression are 1.04 bar and 15^0 C. If the maximum temperature of the cycle is 233^0C, determine
      i. the thermal efficiency and
      ii. The mean effective pressure. [6+10]

6. (a) Differentiate between Microscopic and Macroscopic point of view.
   (b) Prove that the difference between specific heat at constant pressure and specific heat at constant volume is gas constant.
   (c) Explain what do you mean by thermal equilibrium. [4+6+6]

7. A mass of air is initially at 260^0C and 7 bar, and occupies $0.028m^3$. The air is expanded at constant pressure to $0.084m^3$. A polytropic process with n=1.5 is then carried out, followed by a constant temperature process which completes a cycle. All the processes are reversible.
   (a) Sketch the cycle in a p-v & T-s planes,
   (b) find the heat received and the heat rejected in the cycle, and
   (c) find the efficiency of the cycle. [16]

8. Air is compressed from a pressure of 1 bar and a temperature of 21^0C to a pressure of 2 bar and temperature of 38^0C. For this process determine
   (a) change in entropy
   (b) whether heat is added or removed or is it zero
   (c) Also calculate the final temperature if the process were isentropic
   (d) Sketch process for part (c) on a T-s plane [16]

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Code No: RR210304 **RR** **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. Starting from first law and using second law derive the Gibb's equations and hence deduce the Maxwell's relations. [16]

2. Air is compressed from a pressure of 1 bar and a temperature of 21^0C to a pressure of 2 bar and temperature of 38^0C. For this process determine
   (a) change in entropy
   (b) whether heat is added or removed or is it zero
   (c) Also calculate the final temperature if the process were isentropic
   (d) Sketch process for part (c) on a T-s plane [16]

3. Air has a dry bulb temperature of 27^0C and a wet bulb temperature of 20^0C. If the barometer reads 1 bar, Calculate
   (a) the humidity ratio
   (b) the relative humidity
   (c) the dew point
   (d) the enthalpy of mixture per kg of dry air. [16]

4. (a) Differentiate between Microscopic and Macroscopic point of view.
   (b) Prove that the difference between specific heat at constant pressure and specific heat at constant volume is gas constant.
   (c) Explain what do you mean by thermal equilibrium. [4+6+6]

5. A mass of air is initially at 260^0C and 7 bar, and occupies $0.028m^3$. The air is expanded at constant pressure to $0.084m^3$. A polytropic process with n=1.5 is then carried out, followed by a constant temperature process which completes a cycle. All the processes are reversible.
   (a) Sketch the cycle in a p-v & T-s planes,
   (b) find the heat received and the heat rejected in the cycle, and
   (c) find the efficiency of the cycle. [16]

6. (a) Define mean effective pressure. What is its importance in reciprocating engines.

(b) A diesel cycle operating on an air standard cycle has a compression ratio at 15. The pressure and temperature at the beginning of the compression are 1.04 bar and 15^0 C. If the maximum temperature of the cycle is 233^0C determine

i. the thermal efficiency and

ii. The mean effective pressure. [6+10]

7. One kg of gas at pressure $825KN/m^2$ and temperature 327^0C expands to pressure $90KN/m^2$ until the volume becomes five times the initial volume according to the law pv^n = C. Determine

(a) the value of index

(b) Work done

(c) Heat transferred

(d) Change in internal energy. [16]

8. A simple saturation cycle using R-22 is designed for a load of 100 TR. The saturated suction and discharge temperatures are 5^0C and 40^0C respectively. Calculate

(a) The mass flow rate of refrigerant

(b) The C.O.P. and isentropic horsepower.

(c) The heat rejected in the condenser. Use the following data:

t	P	h_l	h_g	S_l	S_g	v_g
^{0}C	bar	KJ/Kg	KJ/Kg	KJ/Kg K	KJ/Kg K	m^3/Kg
5	5.836	205.9	407.1	1.02115	1.7447	0.0404
40	15.331	249.53	416.4	1.16659	1.69953	

Specific heat of vapor is 0.65 KJ/Kg K. [16]

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Code No: RR210304 **RR** **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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   (a) the value of index
   (b) Work done
   (c) Heat transferred
   (d) Change in internal energy. [16]

2. (a) Define mean effective pressure. What is its importance in reciprocating engines.
   (b) A diesel cycle operating on an air standard cycle has a compression ratio at 15. The pressure and temperature at the beginning of the compression are 1.04 bar and 15^0 C. If the maximum temperature of the cycle is 233 , determine
      i. the thermal efficiency and
      ii. The mean effective pressure. [6+10]

3. A simple saturation cycle using R-22 is designed for a load of 100 TR. The saturated suction and discharge temperatures are 5^0C and 40^0C respectively. Calculate
   (a) The mass flow rate of refrigerant
   (b) The C.O.P. and isentropic horsepower.
   (c) The heat rejected in the condenser. Use the following data:

t	P	h_l	h_g	S_l	S_g	v_g
^{0}C	bar	KJ/Kg	KJ/Kg	KJ/Kg K	KJ/Kg K	m^3/Kg
5	5.836	205.9	407.1	1.02115	1.7447	0.0404
40	15.331	249.53	416.4	1.16659	1.69953	

   Specific heat of vapor is 0.65 KJ/Kg K. [16]

4. A mass of air is initially at 260^0C and 7 bar, and occupies $0.028m^3$. The air is expanded at constant pressure to $0.084m^3$. A polytropic process with n=1.5 is then carried out, followed by a constant temperature process which completes a cycle. All the processes are reversible.
   (a) Sketch the cycle in a p-v & T-s planes,
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   (d) Sketch process for part (c) on a T-s plane [16]

7. Starting from first law and using second law derive the Gibb's equations and hence deduce the Maxwell's relations. [16]

8. (a) Differentiate between Microscopic and Macroscopic point of view.
   (b) Prove that the difference between specific heat at constant pressure and specific heat at constant volume is gas constant.
   (c) Explain what do you mean by thermal equilibrium. [4+6+6]

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Code No: RR210304 **RR** **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. Air is compressed from a pressure of 1 bar and a temperature of 21^0C to a pressure of 2 bar and temperature of 38^0C. For this process determine
   (a) change in entropy
   (b) whether heat is added or removed or is it zero
   (c) Also calculate the final temperature if the process were isentropic
   (d) Sketch process for part (c) on a T-s plane [16]

2. A mass of air is initially at 260^0C and 7 bar, and occupies $0.028m^3$. The air is expanded at constant pressure to $0.084m^3$. A polytropic process with n=1.5 is then carried out, followed by a constant temperature process which completes a cycle. All the processes are reversible.
   (a) Sketch the cycle in a p-v & T-s planes,
   (b) find the heat received and the heat rejected in the cycle, and
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   (a) The mass flow rate of refrigerant
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   (c) The heat rejected in the condenser. Use the following data:

t	P	h_l	h_g	S_l	S_g	v_g
^{0}C	bar	KJ/Kg	KJ/Kg	KJ/Kg K	KJ/Kg K	m^3/Kg
5	5.836	205.9	407.1	1.02115	1.7447	0.0404
40	15.331	249.53	416.4	1.16659	1.69953	

   Specific heat of vapor is 0.65 KJ/Kg K. [16]

4. (a) Differentiate between Microscopic and Macroscopic point of view.

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(c) Heat transferred

(d) Change in internal energy. [16]

8. Air has a dry bulb temperature of 27^0C and a wet bulb temperature of 20^0C. If the barometer reads 1 bar, Calculate

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(d) the enthalpy of mixture per kg of dry air. [16]

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