

B.E. Eighth Semester (Mechanical Engineering)  
**Energy Conversion - III (Old)**

P. Pages : 2

Time : Three Hours



**KNT/KW/16/2429**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Answer **three** questions from Section A and **Three** questions from Section B.
  3. Assume suitable data wherever necessary.
  4. Illustrate your answers wherever necessary with the help of neat sketches.
  5. Use of Steam tables, Mollier's Chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.

**SECTION – A**

1. A simple dry and saturated R-12 plant is to develop 4 tonnes of refrigeration. The condenser and evaporator temperatures are 35°C and -15°C respectively. Determine. **13**
- i) The mass flow rate of refrigerant in Kg/s
  - ii) Volume flow rate handled by compressor in m<sup>3</sup>/s.
  - iii) The compressor discharge temperature.
  - iv) The pressure ratio.
  - v) Heat rejected to condenser in KW.
  - vi) Flash gas percentage after throttling.
  - vii) The COP, and.
  - viii) Power required to drive the compressor.
- Compose this COP with COP of Carnot refrigerator operating between temperatures of 35°C and -15°C.
2. a) Prove that the maximum possible COP for absorption system is the product of thermal efficiency of Carnot engine operating between the generator and absorber temperature and COP of Carnot refrigerator operating between the absorber and evaporator temperature. **7**
- b) Explain the importance of Joule Thomson coefficient and inversion temperature when operating a system for liquefaction of gases. **4**
- c) Discuss the desirable properties of an ideal refrigerant. **3**
3. a) 1 kg air at 40°C dry-bulb temperature and 50% relative humidity is mixed with 2 kg of air at 20°C dry-bulb temperature and 20°C dew-point temperature. Determine for the mixed stream. **8**
- i) Temperature and
  - ii) Specific humidity.

- b) Explain the following terms :- 5
- i) Relative humidity.
  - ii) Wet-bulb temperature.
  - iii) Degree of saturation.
4. a) Explain in brief the factors which affect the human comfort. 4
- b) Explain with neat sketch, year round air conditioning system. What are its advantages over other system? 5
- c) Write short notes on psychrometric chart. 4
5. a) Explain the working of closed cycle MHD with neat sketch. 7
- b) Discuss in detail with neat sketch the concept of wind energy conversion system. 6
- SECTION – B**
6. a) Draw and explain sequencing hydraulic circuit. 7
- b) Explain flow control valve in hydraulic system. 6
7. a) Differentiate between seat valve and spool valve used in pneumatic circuit. 4
- b) Explain with neat sketch following valves. 9
- i) Time delay valve.
  - ii) Quick exhaust valve.
  - iii) Flow control valve (variable type)
8. a) What is FRL unit? Explain the different components of FRL unit in brief. 5
- b) Describe the pneumatic circuits for pilot controlled single acting and pilot controlled double acting cylinder. 8
9. a) Explain Energy audit with reference to its importance and utility. 7
- b) Explain the operation of thermo couples and power analyzer used in energy audit. 6
10. Write short notes on **any three**. 14
- a) Vane pump
  - b) Sankey diagram.
  - c) Bleed-off circuit
  - d) Neutrals (Centers) used in 4/3 directional control valves.

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