

III B.Tech II Semester Supplementary Examinations, April/May 2005
REFRIGERATION AND AIRCONDITIONING

(Common to Mechanical Engineering and Production Engineering)

Time: 3 hours**Max Marks: 70**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Derive an expression for C.O.P. of Bell-Coleman Air-refrigerator.
- (b) An air-refrigerator works between pressure limit of 1 bar and 4 bar. The temperature of the air entering the compressor is 15°C and entering the expansion cylinder is 30°C . The expansion cylinder is 30°C . The expansion follows the law $PV^{1.25}=\text{constant}$. The compression follows the law $PV^{1.35}=\text{constant}$. Take for air $C_P = 1\text{kJ/kg-K}$
 $C_V = 0.7 \text{ kJ/kg-K}$

Find the following:

- i. C.O.P. of the refrigerating cycle.
 - ii. If air circulation through the system is 25 kg/min, find the refrigeration capacity of the system.
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2. A refrigerating machine using F12 as working fluid works between the temperatures 18°C and 37°C . The enthalpy of liquid at 37°C is 78kJ/kg. The enthalpies of F12 entering and leaving the compressor are 200kJ/kg and 238 kJ/kg respectively. The rate of circulation of refrigerant is 2kg/min and efficiency of compression is 0.85. Determine.
 - (a) Capacity of the plant in tons of refrigeration
 - (b) Power required to run the plant
 - (c) COP of the plant.
 3. (a) Compare Air-cooled condensers with water cooled condensers.
 - (b) Sketch and explain the working of thermo-static expansion valve.
 4. (a) Sketch and explain the working of simple vapour-absorption system and name the various plants.
 - (b) Briefly discuss the following:
 - i. Anti-freeze solutions
 - ii. Selection of refrigerant.
 5. (a) Explain the working principle of thermo-electric refrigeration systems. Explain the following
 - i. Seebeck effect
 - ii. Peltier effect

- (b) Sketch and explain the working of an electrolux-refrigerator.
6. $30m^3$ of air at $15^{\circ}C$ DBT and $13^{\circ}C$ WBT one mixed with $12m^3$ of air at $25^{\circ}C$ DBT and $18^{\circ}C$ WBT. Assuming the barometric pressure of one standard atmosphere determine the DBT and WBT of the resulting mixture.
7. (a) Explain the following:
- i. Winter Air conditioning
 - ii. Summer Air conditioning
- (b) What are the factors affecting the human comfort, explain.
8. Explain the following and draw neat sketches wherever necessary (any THREE).
- (a) Evaporative condenser
 - (b) Methods of improving COP in VC system.
 - (c) Flooded Evaporators
 - (d) Humidifiers.
