

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester : VI (New)	Term : II	Academic Year : 2016-17
Course No. : APE 368	Title : Refrigeration and Air Conditioning	
Credits : 2 (1+1)	Time : 09.00 to 11.00	Total Marks : 40
Day & Date : Saturday, 29.04.2017		

- Note :**
1. Solve ANY EIGHT questions from SECTION "A".
 2. All questions from SECTION "B" are compulsory.
 3. All questions carry equal marks.
 4. Draw neat diagrams wherever necessary.

SECTION "A"

- Q.1 A sample of air having 22⁰C dry bulb temperature (DBT), 30 per cent relative humidity at barometric pressure of 760 mm of mercury, calculate
1) vapour pressure 2) humidity ratio and 3) vapour density.
- Q.2 Write short notes (Any Two).
- 1) R-22 as refrigerant
 - 2) Summer air conditioning system
 - 3) Ammonia as refrigerant
- Q.3 In a heating application, moist air enters a stream heating coil at 10⁰C, 50% RH and leaves at 30⁰C. Determine the sensible heat transfer, if mass flow rate of air is 100 kg of dry air per second. Also determine the steam mass flow rate if steam enters saturated at 100⁰C and condensate leaves at 80⁰C.
- Q.4 Define air conditioning, state and explain factors affecting comfort air conditioning.
- Q.5 The humidity ratio of atmospheric air at 28⁰C dry bulb temperature and 760 mm of mercury is 0.016 kg/kg of dry air. Determine 1) partial pressure of water vapour; 2) relative humidity; 3) dew point temperature; and 4) specific enthalpy (use steam table).
- Q.6 a) Write brief note on dehumidification process.
b) What are the advantages of vapour absorption refrigeration system over vapour compression refrigeration system?
- Q.7 Find the theoretical C.O.P. for a CO₂ machine working between the temperature range of 25⁰C and -5⁰C. The dryness fraction of CO₂ during the suction stroke is 0.6. Following properties of CO₂ are given:

Temperature (⁰ C)	Liquid		Vapour		Latent heat kJ/kg
	Enthalpy kJ/kg	Entropy kJ/kg K	Enthalpy kJ/kg	Entropy kJ/kg K	
25	164.77	0.5978	282.23	0.9918	117.46
-5	72.57	0.2862	321.33	1.2146	248.76

(P.T.O.)

- Q.8 a) Write detail note on reverse carnot cycle.
b) State differences between a heat engine, refrigerator and heat pump with neat diagrams and equations.
- Q.9 Enlist different types of refrigeration systems. Write in detail about steam jet refrigeration system with neat diagram.
- Q.10 a) Define human comfort. Enlist factors affecting human comfort.
b) Define psychrometry. Enlist different psychrometric properties of air.

SECTION "B"

Q.11 Define the following terms.

- 1) Degree of saturation
- 2) Refrigeration
- 3) Latent heat
- 4) Absolute humidity

Q.12 Match the following pairs.

"A"

- 1) R-12
- 2) R-22
- 3) Ammonia
- 4) Carbon dioxide

"B"

- a) Boiling point is -73.6°C
- b) Boiling point of -33.3°C at atmospheric pressure
- c) Boiling point of -41°C at atmospheric pressure
- d) Boiling point of -29°C at atmospheric pressure
- e) Boiling point of -128°C at atmospheric pressure

