

D 51109

(Pages 2)

Name.....

Reg. No.....

**EIGHTH SEMESTER B.TECH. (ENGINEERING) DEGREE
EXAMINATION, DECEMBER 2008**

ME 04 804 D—HEATING, VENTILATION AND AIR CONDITIONING SYSTEM DESIGN
(2004 Admissions)

Time : Three Hours

Maximum : 100 Marks

Use of Psychrometric Chart Permitted.

Answer Question 1 and for questions 1 to 5 answer (a) or (b) in each question.

1. (a) What is the purpose of aspirator of an aspirator in a psychrometer ?
- (b) What precautions would you observe before taking readings from a psychrometer ?
- (c) Which load depends upon the storage volume ?
- (d) What is the usage factor ?
- (e) Explain volume control, by-pass control and reheat control for taking care of part loads.
- (f) Define Fan power and Fan efficiency.
- (g) Explain the concept of Effective sensible heat factor for room to be air-conditioned.
- (h) Discuss the total heat loss from human body and how it varies with effective temperature and activity of human beings.

(8 × 5 = 40 marks)

Part B

2. (a) What would be the final dry-bulb, and humidity conditions if 2 m³ of air at 293 K dry-bulb and 288 K wet-bulb temperatures mixes with 3 m³ of air at 273 K dry bulb 80% relative humidity ?

(15 marks)

Or

- (b) (i) How will you utilize psychrometric reading in the determination of relative humidity ? Do you require steam table ? What is usually with psychrometres by manufactures ?

(10 marks)

- (ii) What is the alignment circle on the psychrometric chart ?

(5 marks)

3. (a) Estimate the cooling load using short cut method for a cabinet having dimensions 5.5 × 3 × 3m high. The overall heat transfer coefficient is given to be 5 kJ/m²-h-K. The storage and ambient temperatures are 263 K and 303 K, respectively. Heavy usage may be assumed.

(15 marks)

Or

Turn over

- (b) Find the cooling and heating load requirement for a hall for 50 persons. The enthalpy change of air is 20 kJ/kg. The hall has dimensions $20 \times 10 \times 5$ m high. Energy release per person may be taken to be 600 kJ/h. The electrical appliances are 15 bulbs of 60 W each, one machine 1 Kw and refrigerator of 200 W. The $U \Delta T$ may be taken to be 200 kJ/m². If a year round air conditioning employed having COP = 3, compare the energy requirement for the two systems (cooling and heating.)

(15 marks)

4. (a) A main duct $60 \text{ cm} \times 60 \text{ cm}$ carries air at a rate of 280 cmm, and branches into two ducts $60 \text{ cm} \times 30 \text{ cm}$ and $60 \text{ cm} \times 45 \text{ cm}$. If the mean velocity in the larger branch is 550 m/min, calculate the mean velocity in the main duct and the other branch and also the mean velocity pressure in each duct assuming standard density.

(15 marks)

Or

- (b) A 20 cm duct converges gradually to 7.5 cm duct. The static pressure just upstream is 3 cm of water and the velocity is 450 m/min. The loss of pressure in the reducer is 105 of the velocity head in the duct down stream of the reducer. Determine the rate of discharge, velocity pressure and total pressure upstream of the reducer, pressure loss in the reducer, static, velocity and total pressure downstream of the reducer and the pressure indicated by a U-tube water manometer connected differentially to pressure tapping upstream and downstream of the reducer.

(15 marks)

5. (a) Explain with the help of neat sketches the constant volume, variable temperature system.

(15 marks)

Or

- (b) With the help of neat sketch explain the main components of evaporative cooling system.

(15 marks)

[4 × 15 = 60 marks]