Total No. of printed pages = 4

ME 1818 PE 21

16/6/22

Roll No. of candidate | | | | | | | | | | |

2022

B.Tech. 8th Semester End-Term Examination

ME

AIR CONDITIONING

(New Regulation w.e.f. 2017-18 & New Syllabus w.e.f. 2018-19)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Choose the correct answers : (10 × 1 = 10)

(i) For heating and humidification of air, it is passed through

(a) Water spray and then heated

(b) Hot water spray

(c) Over the heated surface

(d) None

(ii) During an air conditioning of a plant, the room sensible heat load is 40 kW and room latent heat load is 10 kW, ventilation is 25% of the supply air, at full load the sensible heat factor will be

(a) 0.9 (b) 0.8

(c) 0.7 (d) 0.6

(iii) If a mass of air in air tight vessel heated to a higher temperature, then

(a) Specific humidity of air increases

(b) Specific humidity of air deceases

(c) Relative humidity of air increases

(d) Relative humidity of air increases

(iv) During the evaporation cooling process, wet bulb temperature

(a) Increases (b) Decreases

(c) Remains constant (d) Unpredictable

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(v) The latent heat load is 25% of the sensible heat load, The sensible heat factor is

(a) 0.3 (b) 0.5

(c) 0.8 (d) 1.0

(vi) In spray washing system, if the temperature of water is higher than the dry bulb temperature of air entering, then the air is

(a) Heated and dehumidified (b) Heated and humidified

(c) Cooled and humidified (d) Cooled and dehumidified

(vii) If air is heated without changing its moisture content, the dew point will

(a) Increase (b) Decrease

(c) Remains the same (d) Unpredictable

(viii) In air conditioning plant, air enters the cooling coil at 27°C. The coil surface temperature is –5°c. If the bypass factor of the unit is 0.4, the air will leave the coil at

(a) 5.6°C (b) 7.8°C

(c) 9.2°C (d) 11.2 °C

(ix) An psychrometric chart, the bulb temperature lines are ————.

(a) Horizontal

(b) Vertical

(c) Curved

(d) Straight inclined Sloping downward to the right

(x) Inside design conditions for comfort air Conditioning are

(a) 20 to 24°C and 80% RH

(b) 24 to 28°C and 100% RH

(c) 22 to 27°C and 40 to 60% RH

(d) None

2. (a) Explain the terms (i) wet bulb temperature and (ii) degree of saturation and (iii) relative humidity. (5)

(b) Calculate (i) relative humidity (ii) humidity ratio (iii) dew point temperature (iv) density (v) enthalpy of atmospheric air when the DBT is 35°C, WBT is 23 °C and the barometer reads 750 mm Hg. (10)

3. (a) Explain the term by-pass factor used for Cooling or heating coil. (3)

(b) Define the term comfort and explain the factors which affect the comfort. (5)

(c) Explain the term flywheel effect of building materials. (3)

(d) Define the term Effective sensible heat factor and explain its significance. (4)

4. (a) Draw a typical characteristic curve for fans. (3)

(b) Name different methods used in controlling room air condition at partial load. (4)

(c) Explain face and bypass control method with a schematic diagram. (8)

5. (a) State the general rules followed in the design of air duct for distribution of air in air conditioning. (3)

(b) In the duct layout shown in figure below, outlets 1 and 2 delivers 20 cm and outlet 3 delivers 28 cm. Select a velocity of 8 m/s in section A. Size the duct each using any duct design method and determine its static pressure requirements. (12)

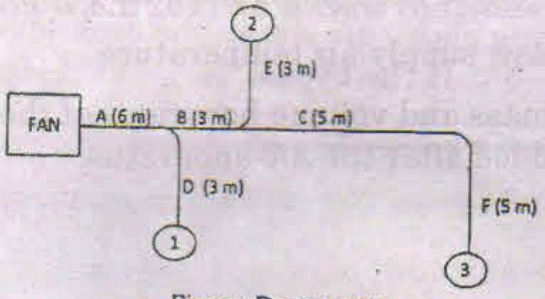

Figure: Duct system

6. (a) What are the factors necessary for the selection of air condition apparatus for cooling and dehumidification? (3)

(b) A shop located in a city has the following loads (12)

Room sensible heat: 58.15 kW

Room Latent heat 14.54kW

The summer outside and tile inside design conditions are

Outside :40°C DB, 27°C WB

Inside 25 °C DB, 50% RH

70 cmm of ventilation air is used. Determine the following

(i) Ventilation load

(ii) Grand total heat

(iii) Effective sensible heat factor

(iv) Apparatus dew point

(v) Dehumidified air quantity

(vi) Conditioned of air entering and leaving apparatus.

The bypass factor for the cooling coil is 0.15.

7. (a) Explain the limitation of the evaporative cooling. (3)

(b) An air conditioned space is maintained at 26°C DBT and 60% RH when the outside conditions 35°C DBT and 28°C WBT. (12)

(i) If the space has a sensible heat gain of 20kw and air is supplied to the room at a conditioned of 8°C saturated, calculate

(1) The mass and volume flow rate of air supplied to the room

(2) The latent heat gain of the space

(3) The cooling load of tile refrigeration plant if 15% of the total weight of air supplied to space is fresh air and the remainder is recirculated air.

(ii) If the supply of air to the loom is to be maintained at a level of at least 6 cmm per ton of tile cooling load, find

(1) Tile new supply air temperature

(2) The mass and volume how rates of the supply air and recirculated air added after the A/c apparatus.