**CMGT 235 – Electrical and Mechanical Systems**

Department of Construction Management 🏵 California State University, Chico

Exam #1 [100 points]

**You may work together as a group or individually. Every student SHALL complete their own answer sheet.**

|  |
| --- |
| Name: |
| Name: |
| Name: |

15 pts

1. A 6 in x 6 in x 3 in ice cube is held in a freezer at 0°F. How much heat is required to turn the ice cube to steam?
2. For the tiny home plan shown the inside temperature is 72°F and the outside temperature is -15°F.

35 pts

Specifications

|  |  |
| --- | --- |
| Window SizesBathroom 3 ft x 2 ftNook 3 ft x 3 ftLiving Room 6 ft x 4 ft and 5 ft x 3 ftMaster Bedroom 5 ft x 3 ft EDoor 21 ft2 ECeiling Height 8 ftWood Porch 4 ft x 18 ft | Walls R-19 (6” insulation)Ceilings R-30 (10” insulation)Windows R-3.13Doors R-3.70Floor SOG (2 in thick edge insulation, R=5) |



**Use 3-decimals for all U-factors. Round all calculations to whole numbers.**

1. Determine the total heat loss due to transmission.
2. Determine the heat loss due to infiltration for an ACH = 1.2
3. Determine the Total Heat Loss.
4. Calculate the total heat loss during a 24-hour period for a flat roof 55 ft X 70 ft. The roof is constructed per the detail below. The inside temperature is 70 °F and the outside temperature is 52 °F. Assume winter conditions. Use 2-decimals for R Values and 3-decimals for U-Factors. Round answer to a whole number.

25 pts



|  |  |  |  |
| --- | --- | --- | --- |
|  |  | R (Between joist) | R (At joist) |
| 1. | Air film outside |  |  |
| 2. | 3/8 in. Built-up roofing |  |  |
| 3. | 5/8 in. Plywood Sheathing |  |  |
| 4. | 1 ½ in. Air space |  |  |
| 5. | R-13 Fiberglass Batt Insulation |  |  |
| 6. | 5/8 in. Gypsum board |  |  |
| 7. | Air film inside |  |  |
| 8. | Nominal 2-in x 12-in Doug Fir Joist @ 24 in. o.c. |  |  |
| RTotal |  |  |

Determine the average U-Factor for the ceiling

Psychrometric Chart

10 pts

1. Given the ambient temperature is 70°F measured by a dry bulb thermometer and 60°F measured by a wet bulb thermometer, what is the relative humidity?

Is this point an acceptable temperature and humidity for personal comfort all year for people in the USA?

15 pts

1. A house is 4500 ft² and has 12 ft ceilings. For comfort, the homeowner specifies 0.3 changes of air per hour. The outside air temperature is 90°F dry bulb and 73.5° wet bulb. The air indoors is 75°F dry bulb 50% relative humidity. What is the amount of cooling required to provide the fresh air?