Energy Efficient Building Design College of Architecture Illinois Institute of Technology, Chicago

ARCH 551 – 001 NAME:_____

Fall Mid-Term October 2004 ID NO:_____

True or **False:** 2 points for correct answer. 0 points for no answer. -1 point for incorrect answer
Grading is Curved. Highest student score is 100%.

Circle **T** (true) or **F** (false)

T or **F** -- The United States and Canada still use the Inch-Pound (English) system Not Canada

T or **F** -- The Illinois Building Code does not permit all electric heating of buildings in Illinois

T or **F** -- It is mandatory to comply with Professional Society/Institute Standards and Guidelines

T or **F** -- The International Energy Conservation Code applies to buildings in the USA and Canada only

T or **F** -- The Chicago Energy Conservation Code is mandatory for buildings in Illinois

T or **F** -- The National Electrical Code is issued by National Fire Protection Association

T or **F** -- ASHRAE Standard 90.1 (Energy Conservation) is mandatory for buildings in Illinois

T or **F** -- ASHRAE Standard 90.1 (Energy Conservation) applies to residential buildings commercial

T or **F** -- ASHRAE Standard 62 deals with thermal indoor comfort conditions ventilation

T or **F** -- ASHRAE Standard 55 deals with ventilation and indoor air quality comfort

T or **F** -- ASHRAE Standard 90.2 (Residential) applies to small single family and mobile homes

T or **F** -- ASHRAE Standard 90.2 (Residential) applies residential buildings that are less than 10 floors 4 flrs

T or **F** -- ASHRAE Standard 90.1 (Commercial) applies to residential buildings greater than 4 floors

T or **F** -- Energy codes do not apply to industrial buildings

T or **F** -- Additions to existing buildings do not have to comply with codes

T or **F** -- Federal buildings do not have to comply with national or local codes and standards

T or **F** -- All existing federal buildings must be remodeled by 2010 to reduce energy by 35% base 1985

T or **F** -- State energy codes are based on ASHRAE Standard 90.1 for energy conservation

T or **F** -- State energy codes are based on IECC (International Energy Conservation Code)

T or **F** -- New commercial office buildings must comply with 10CFR434/435 but not IECC

T or F -- Life Cycle Cost Analysis (LCCA) is mandatory for proposed new federal building design

T or F -- LCCA is part of code compliance for proposed new commercial building design in Chicago

T or F -- Energy computer programs consist of LOADS, SYSTEMS, PLANTS & ECONOMICS

T or F -- The use of the DOE2 computer program is mandatory for showing code compliance

T or F -- Hydro-electric power can be considered renewable energy

T or F -- Buildings in downtown Chicago can generate their own electicity using fossil fuel

T or F -- Nuclear power can be considered renewable energy

T or F -- Ozone depletion in the upper atmosphere is due to CFC refrigerants used in air-conditioning

T or F -- Burning fossil fuels (oil, natural-gas, coal) generates carbon monoxide carbon dioxide

T or F -- Acid rain is caused by burning fossil fuel.

T or F -- The official definition of "HIGH-Rise Building" in the USA is 10 floors or more No definition

T or F -- There is no official definition for a "MID-Rise Building"

T or F -- Fires in upper floors "HIGH-Rise Building" have to fought from the inside

T or F -- "Tall Building" is defined by ASHRAE TC-9.12 as 300 feet or more

T or F -- "Tall Buildings" in the USA require open intermediate floors as refuge areas from fires

T or F -- "Domestic Hot Water (DHW) heaters" is one of 4 categories for ASHRAE Std 90 compliance.

T or F -- The 3 categories of code compliance in California Title-24 are Envelope, Lighting & Mechanical

T or F -- Prescriptive code compliance can be demonstrated without an energy analysis computer program

T or F -- Energy Cost Budget (ECB) method of code compliance requires utilty rates & costs analysis

T or F -- Energy Cost Budget (ECB) method of code compliance requires life cycle cost analysis

T or F -- ECB method compares a prototype prescriptive building with the proposed building design.

T or F -- ECB method requires 8760 hours of energy analysis

T or F -- The energy computer program for the ECB method must be certified by the US Dept. of Energy

T or F -- Azimuth Angles are measured anti-clockwise from South using the ASHRAE convention

T or F -- Azimuth Angles are measured clockwise from North using the DOE convention

T or F -- South-West Wall Azimuth Angle is 45 degrees using the ASHRAE convention

T or F -- South-East Wall Azimuth Angle is -45 degrees using the DOE convention 135 degrees

T or F -- The Azimuth Angle must be specified for Tilted Roofs

T or F -- A Horizontal Roof has a Tilt Angle = 0 and an Azimuth Angle = 0

T or F -- Roof Tilt Angles are measured anti-clockwise from the horizontal plane inside horiz to roof

T or F -- Building North Angle is measured anti-clockwise from the True North (DOE convention)

T or F -- Skylight Tilt Angle can be different from the Roof (on which it is located) Tilt Angle

T or F -- Energy standards for roofs & skylights are more stringent than those for wall & windows

T or F -- A roof with a tilt angle greater than 50 degrees can be considered a wall > 60 degrees

T or F -- The building envelope can consist of fenestration components only

T or F -- A window is the glass areas of the wall includes frame etc.

T or F -- Floor on grade (ground) need not be insulated if its overall U-Factor complies with code

T or F -- A garage that has space heating only is an unconditioned space

T or F -- A wall separating a heated only space and an air conditioned space is an exterior envelope semi

T or F -- Semi exterior walls separate conditioned spaces from unconditioned spaces

T or F -- Wall separating a conditioned space from a ventilated only space is an exterior envelope

T or F -- Semi-Heated Space is one of 3 types of spaces covered by ASHRAE Standard 90

T or F -- All permanently occupied spaces in Chicago are considered conditioned

T or F -- A two story motel with 20 units at 500 ft2/unit is a residential building

T or F -- A ten story apartment building is a commercial building

T or F -- Hospital patient rooms with separate systems can be considered a residential building

T or F -- Mixed-Use building with residential and commercial spaces can be considered separately

T or F -- Residental building energy standards are more stringent than those of commercial buildings

T or F -- An electrical closet with exhaust ventilation only is a conditioned space in commercial buildings

T or **F** -- A semi-heated space can be used for normal (extended) occupancy

T or **F** -- The winter inside temperature in a semi-heated space must be at least 60°F

T or **F** -- Fenestration energy standards are based on Window-Wall (W-W) and Skylight-Roof (S-R) ratios

T or **F** -- The maximum W-W ratio for prescriptive compliance in ASHRAE Std90 is 40% 50%

T or **F** -- The maximum S-R ratio for prescriptive compliance in ASHRAE Std90 is 10% 5%

T or **F** -- ASHRAE Std90 envelope criteria is based on summer & winter design weather data HDD & CDD

T or **F** -- Heating Degree Days base 65 (HDD65) is the sum of (65 - average day temp) for 365 days +ve only

T or **F** -- Heating Degree Days can also be measured from a base temperature of 50°F

T or **F** -- ASHRAE Std90 is based on Cooling Degree Days base 60°F CDD50

T or **F** -- The Chicago & Boston climatic region in ASHRAE Std90 is B-17

T or **F** -- The Chicago & New York City climatic regions in ASHRAE Std90 are the same

T or **F** -- The U-Factor of concrete is its resistance to heat flow unit rate of heat flow

T or **F** -- The R-Value of concrete is a measure of the Rate of heat flow through it resistance

T or **F** -- SHGC is the ratio of solar heat gain thru the glass and the heat flow thru 1/8" clear single glass SC

T or **F** -- SC is the ratio of solar heat gain thru glass and the total solar radiation at the outside surface SHGC

T or **F** -- SHGC is about 15% greater than SC

T or **F** -- Heat Transfer occurs from the colder side of the envelope to the warmer side

T or **F** -- The U-Factor of the envelope can ignore the studs if they are more than 24" on-center

T or **F** -- Steel framed and metal building walls must have thermal blocks composite U must include steel

T or **F** -- ASHRAE Std90 for mass walls is more stringent than metal building walls

T or **F** -- Mass walls do not need insulation if the overall U-Factor meets ASHRAE Std90

T or **F** -- Outside air infiltration can occur thru opaque walls

T or **F** -- 10CFR435 standard for maxim infiltration thru fixed windows is 1 cfm/ft2 of window area 0.15

T or **F** -- In cold climates a vestibule must be provided at all entrances of high rise buildings main entrances

T or **F** -- Only the main frequently used entrance requires a vestibule for residential buildings not required

T or **F** -- Codes & Standards give credit for windows with overhangs and side fins

T or **F** -- The overhang need not be a fixed permanent part of the building

T or **F** -- Overhangs must be within 2 feet from the top of the window glazing

T or **F** -- Projection Factor (PF) is ratio of the length of the overhang and the window height.

T or **F** -- The moon has no effect on the weather and tides on the earth

T or **F** -- A location on earth is determined by Latitude and Longitude only. & altitude

T or **F** -- Solar radiation at a location depends on both Latitude and Longitude latitude only

T or **F** -- Absolute solar radiation at a location varies with altitude from sea level

T or **F** -- The sea level can vary in different parts of the earth

T or **F** -- Diffuse and scattered solar radiation mean the same thing

T or **F** -- After sunset and before sunrise the total solar radiation is zero diffuse radiation

T or **F** -- Latitude = 0 occurs at the center circumference of the earth measured horizontally

T or **F** -- Longitude = 0 occurs at the center circumference of the earth measured vertically

T or **F** -- There are only 360 lines of longitudes and 180 lines of latitudes can have fractions

T or **F** -- By international convention, longitudes West of London are positve and East are negative

T or **F** -- The sun moves between 23.5^{o} North and 23.5^{o} South latitudes sun does not move

T or **F** -- The sun's declination angle varies between 23.5^{o} North and 23.5^{o} South

T or **F** -- Absolute Solar radiation at a location depends on both sun altitude and NO sun azimuth angles

T or **F** -- There is a one hour solar time difference between every 10 degrees of longitude 15 degrees

T or **F** -- Solar time and local time can be the same depending on the longitude of the location

T or **F** -- Solar noon (maximum sun altitude for the day) occurs at the same time every day

T or **F** -- The sun's ray can be perpendicular to a horizontal roof in Chicago

T or **F** -- The solar radiation on a surface depends on the angle made by the sun's ray and the surface

T or **F** -- Liquids are fluids that do not have a definite volume

T or F -- A vapor is a gas

T or F -- Steam can exist at 40 °F

T or F -- Water can exist at 400 °F

T or F -- Weight and mass mean the same thing

T or F -- A mass of 200 kilograms will weigh less on the moon

T or F -- Density is weight per unit volume and depends on the planet's gravitational pull

T or F -- Weight in the Metric system is called a Kilogram

T or F -- Mass in the English system is called a Pound (LB)

T or F -- Temperature is a measure of the total heat content of a substance

T or F -- Temperatures can be added: 30 °F + 40 °F = 70 °F

T or F -- The amount of heat contained in a substance depends on its mass and temperature

T or F -- The quantity of heat in a gas depends on the volume occupied by the gas

T or F -- -273 °C = -460 °F (C = Celsius and F = Fahrenheit)

T or F -- -0 °C = -0 °F

T or F -- -40 °C = -40 °F

T or F -- -0 °R = -0 °K (R = Rankine anf K = Kelvin)

T or F -- According to Boyles Law Volume x Temperature of a gas is constant PxV = const

T or F -- According to Charles Law Pressure x Temperature of a gas is constant V/T = const

T or F -- According to Daltons Law Pressure x Volume / Temperature of a gas is constant Gen Gas Law

T or F -- The quantity of heat in a substance depends on the molecular weight of the mass

T or F -- BTU is the amount of heat required to raise the temp of 1 gallon of water through 1°F 1 pound

T or F -- The specific heats of air and water are 0.24 and 1.0

T or F -- Heat required to raise one pound of substance through one degree F is called Specific Heat

T or F -- The heat quantity of 1 lb of mercury at 70 °F is greater than that of 1 lb of water at 70 °F

T or **F** -- Gage pressure = Absolute Pressure - Atmospheric Pressure Absolute + Atmos

T or **F** -- Dalton's Law deals with the partial pressures of gases in a mixture of gases

T or **F** -- Specific Volume of air is the reciprocal (inverse) of the density (1 / density)

T or **F** -- Specific Gravity of water = Specific Heat of water = 1.0 (English units)

T or **F** -- The amount of heat required to raise 10 lbs of water from 50 oF to 150 oF is 1000 calories btu

T or **F** -- Pressure due to 10'H x 15'W x 15'L column of water = 10'H x 2'W x 2'L column of water

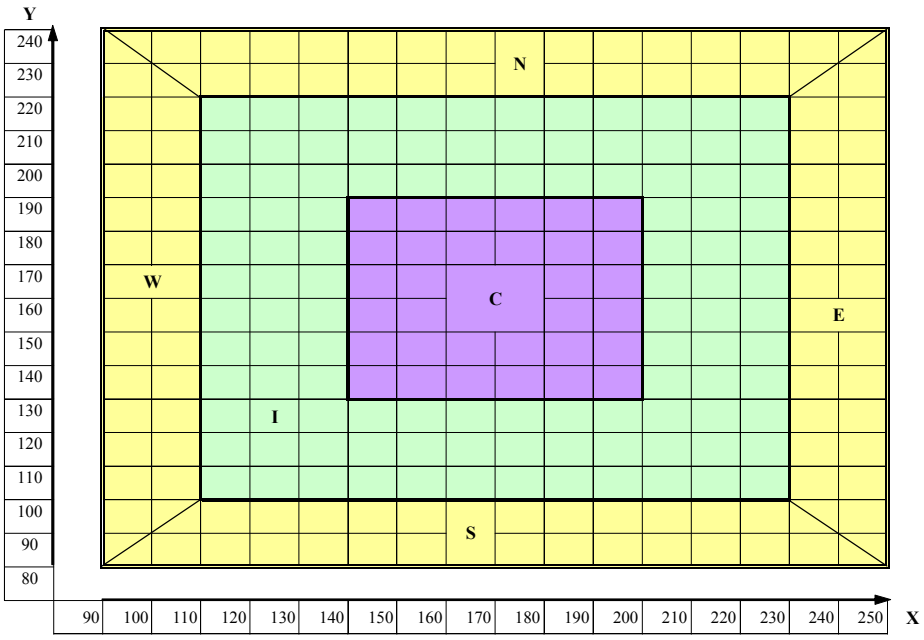
T or **F** -- Water can be used to measure temperature

T or **F** -- Heat gain & loss calculations must use absolute temperatures dealing with temp difference

T or **F** -- The general gas law equation PV = MRT is based on absolute temperatures

Complete the tables with (1) Building, (2) Space, (3) Wall, (4) Window **ABSOLUTE** Coordinates

BUILDING COORDINATES **Absolute Coordinates**



BUILDING ORIGIN

Absolute Coordinates

x	y	z

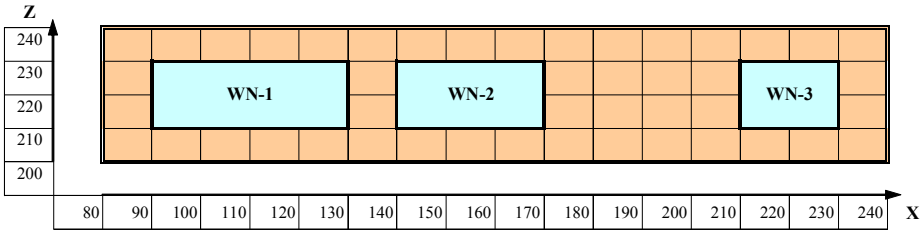
SPACE ORIGINS **Absolute Coordinates**

Zone	Area	x	y
N			
E			
S			
W			
I			
C			

WALL ORIGINS **Absolute Coordinates**

Zone	Exterior		Right Inter		Back Inter	
	x	y	x	y	x	y
N						
E						
S						
W						

SOUTH WALL **10th Floor**

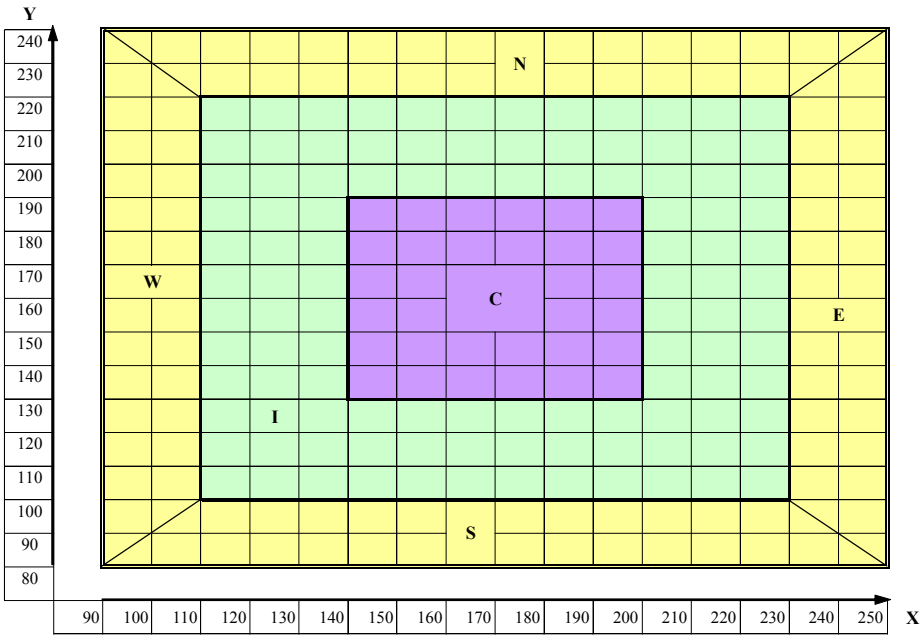


WINDOW ORIGINS **Absolute Coordinates**

Wndw	H	W	x	y	z
WN-1					
WN-2					
WN-3					

Complete the tables with (1) Building, (2) Space, (3) Wall, (4) Window **RELATIVE** Coordinates

BUILDING COORDINATES **Relative Coordinates**



BUILDING ORIGIN **Relative Coordinates**

x	y	z

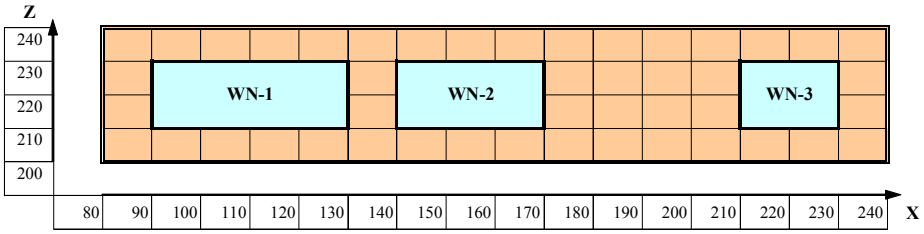
SPACE ORIGINS **Relative Coordinates**

Zone	Area	x	y
N			
E			
S			
W			
I			
C			

WALL ORIGINS **Relative Coordinates**

Zone	Exterior		Right Inter		Back Inter	
	x	y	x	y	x	y
N						
E						
S						
W						

SOUTH WALL **10th Floor**



WINDOW ORIGINS **Relative Coordinates**

Wndw	H	W	x	y	z
WN-1					
WN-2					
WN-3					