Name:

Enrolment No:

UPES
UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: GREEN BUILDINGS **Semester: III**
Program: M Tech ES and REE **Time 03 hrs.**
Course Code: EPEC-8009 **Max. Marks: 100**

Instructions:

Section A: Attempt all questions
Section B: Attempt all questions and Attempt any one from question Q9(a) or Q9(b).
Section C: Attempt all questions and Attempt any one from question Q11(a) or Q11(b).

SECTION A

S. No.		Marks	CO
Q 1	Discuss any four factors which can impact the energy use of a building.	**4**	**CO1**
Q2	List any four key points which differentiate the GRIHA Rating system from LEED Green Building Rating System.	**4**	**CO2**
Q3	Discuss some building material which impact the indoor air quality of Building.	**4**	**CO3**
Q4	Explain how the integration of renewable energy with the buildings improves the performance of the buildings.	**4**	**CO4**
Q5	Illustrate the importance of window to wall ratio and building orientation.	**4**	**CO3**

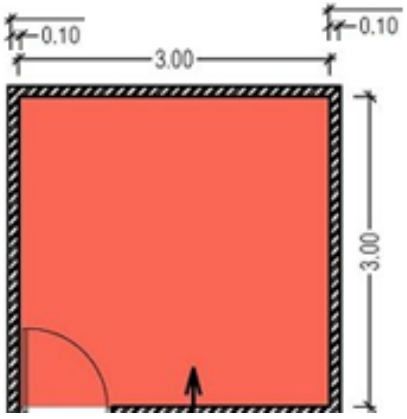
SECTION B

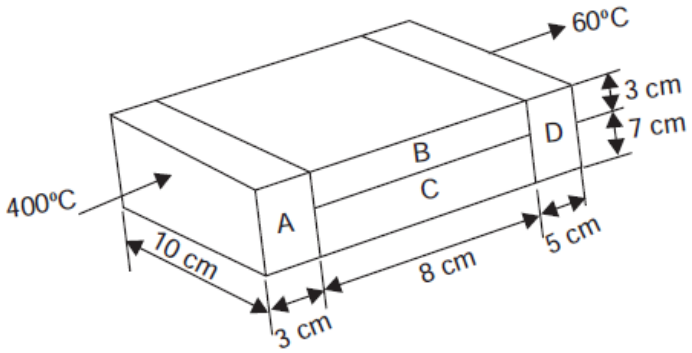
Q 6 — **10** — **CO1**

In a commercial building the energy use on daily basis are given below;

Sr. No	Energy Type	Quantity
1	Electricity	230 kWh
2	Diesel	30 Lt. Daily
3	Solar Energy through PV System	100 kWh

Calculate the EPI of the building whose dimensions are given below,



<table>
<tr><td>Q7</td><td>Explain any 5 mandatory criterions as per GRIHA norms of Green Building Rating System specified for,
i. Building Envelope
ii. HVAC
iii. Lighting System</td><td>10</td><td>CO2</td></tr>
<tr><td>Q8</td><td>Find the heat flow rate through the composite wall as shown in Figure below, Assume one dimensional flow.
k_A = 150 W/m°C,
k_B = 30 W/m°C,
k_C = 65 W/m°C and
k_D = 50 W/m°C.
 
</td><td>10</td><td>CO4</td></tr>
<tr><td>Q9(a)</td><td>Explain in detail how the daylighting will impact the indoor air quality by giving some examples.</td><td>10</td><td>CO3</td></tr>
<tr><td colspan="4">OR</td></tr>
<tr><td>Q9 (b)</td><td>Discuss in detail any 5 building materials identified according to WHO report which is causing impact on human health.</td><td>10</td><td>CO3</td></tr>
<tr><td colspan="4">SECTION-C</td></tr>
<tr><td>Q 10</td><td>After the energy audit of the chillers following observations was made,
<table>
<tr><th>Parameter</th><th>Units</th><th>Measured Data</th></tr>
<tr><td>Power drawn by compressor motor</td><td>kW</td><td>112</td></tr>
<tr><td>Motor efficiency</td><td>%</td><td>92</td></tr>
<tr><td>Compressor circuit –2 A loading</td><td>%</td><td>61</td></tr>
<tr><td>Compressor circuit –2 B loading</td><td>%</td><td>59</td></tr>
<tr><td>Primary pump power</td><td>kW</td><td>11.8</td></tr>
<tr><td>Secondary pump power</td><td>kW</td><td>2.5</td></tr>
<tr><td>Chilled water flow through the primary circuit</td><td>m^3/hr</td><td>165</td></tr>
<tr><td>Chilled Water temp. Inlet to evaporator</td><td>°C</td><td>8.8</td></tr>
<tr><td>Chilled Water temp. Outlet of evaporator</td><td>°C</td><td>7.2</td></tr>
</table>
Determine weather the given building HVAC System comply with ECBC Code (given below) or not.</td><td>20</td><td>CO4</td></tr>
</table>

Chiller Capacity (kWr)	*ECBC Building* COP	IPLV	*ECBC+ Building* COP	IPLV	*SuperECBC Building* COP	IPLV
<260	4.7	5.8	5.2	6.9	5.8	7.1
≥260 & <530	4.9	5.9	5.8	7.1	6.0	7.9
≥530 &<1,050	5.4	6.5	5.8	7.5	6.3	8.4
≥1,050 &<1,580	5.8	6.8	6.2	8.1	6.5	8.8
≥1,580	6.3	7.0	6.5	8.9	6.7	9.1

Q11(a)	Explain in detail the measures you can recommend in an existing commercial building located in Uttarakhand which may help to make the building qualify for GRIHA Rating System. Give some relevant examples and necessary diagrams to prove your point.	**20**	**CO1, CO2**
	OR		
Q11(b)	Explain in detail the measures you can recommend in an existing commercial building located in Uttarakhand which may help to make the building qualify for LEED India Rating System. Give some relevant examples and necessary diagrams to prove your point.	**20**	**CO1, CO2**