1.with the composite wall ,the most important thing is to find the total heat transfer rate then use the function to solve it.

R_{total} =6.8164 c/w

$Q=\Delta T / R_{total}$ =30/6.8164=4.4W

2.Solve the same question while the thickness of the brick is increase to 32cm

R conv 1 = 1/h1.A = 1/(10*0.25)=0.4 ℃/W

R foam = L/(K.A) = 0.03/(0.026*0.25)=4.6154 ℃/W

R plaster1 = R plaster2 = L/(K.A) = 0.02/(0.22*0.25)=0.3636 ℃/W

R brick= L/K.A= 0.32/(0.72*0.22)=2.0202 ℃/W

R plaster3 = R plaster3 = L/(K.A) = 0.32/(0.22*0.015) = 96.9697 ℃/W

1/R p&b= 1/ R plaster3 + 1/R brick + 1/R plaster3= 1/96.9697 + 1/2.0202 + 1/96.9697=0.5156

R p&b=1.9395 ℃/W

R conv 2 = 1/h2.A = 1/(40*0.25)=0.1

R total= R conv 1 +R foam+ R plaster1+ R plaster2+ R brick+ R p&b+ R conv 2

= 0.4+4.6154+0.3636+1.9395+0.3636+0.1=7.7821 ℃/W

Q=(T1 – T2)/ R total = (20-(-10))/7.7821=3.855 W

3. Solve again the simplified wall calculation procedure replacing the glass fiber one with urethane rigid foam and while replacing the fiberboard with plywood and find the two R values.

Determine the overall unit thermal resistance(the R-value) and the overall heat transfer coefficient(the U-factor) of a wall frame wall that is built around 38-mm 90-mm wood studs with a center-to-center distance of 400mm. The 90-mm-wide cavity between the studs is filled with urethane rigid foam. The inside is filled with 13-mm gypsum wallboard and outside with 13-mm plywood and 13-mm 200-mm wood bevel lapped siding. The insulated cavity constitutes 75% heat transmission area while the studs, plates, and sills constitutes 21%. The headers constitutes 4% of the area, and they can be treated as studs.

	A PART	B PART
	WOOD	INSULATION
OUTSIDE AIR	0.03	0.03

WOOD BEVEL	0.14	0.14
FIBER BOARD(13MM)	0.23	0.23
GLASS FIBER INS	NO	0.7 x 90/25=2.52
WOOD STUS	0.63	NO
GYPSUM BOARD	0.079	0.079
INSIDE SURFACE OR AIR	0.12	0.12

$R_{\text{with wood stus}} = 0.03+0.14+0.23+0.63+0.79+0.12 = 1.109\ m^2\ C/W$

$R_{\text{with insulation}} = 0.03+0.14+0.23+2.52+0.70+0.12 = 3.119\ m^2\ C/W$