```
# Design of tension member
Tu =float(input("Enter the value of ultimate tensile strength:"))
fy =float(input("Enter the value of yield strength of steel:"))
fu= float(input("Enter the value of ultimate strength of steel:"))
fub= float(input("Enter the value of ultimate strength of bolt:"))
Gamma_mo= float(input("Enter the value of partial factor of safety Garmma mo:"))
Gamma_m1= float(input("Enter the value of partial factor of safety Garmma_m1:"))
Gamma_mb= float(input("Enter the value of partial factor of safety Gamma_mb:"))
print("Gross Area Required")
Agreq= 1.1* Tu* 1000/fy
print("The value of gross area required is:", 1.2*Agreq)
# Selection of section
# Selecting ISA 100x65x8
Ag= float(input("Enter the value of gross area of steel is:"))
Lc1= float(input("Enter the length of connected leg:"))
Lo1 = float(input("Enter the length of outstand leg:"))
t= float(input("Entert the value of least thickness: "))
Ag = 1257
# Design of connections
d = float(input("Enter the value of diameter of bolt:"))
do=d + 2
print("The diameter of bolt hole is:", do)
# As per IS code minimum pitch distance is
pmin = 2.5 *d
print("The minimum pitch is:", pmin)
# Edge distance as per IS 800 is
e= 1.5* do
print("Enter the value of edge distance:", e)
nn= float (input("Number of shear planes with threaded intercepting the shear plane:"))
ns = float (input("Number of shear plane without threads:"))
Anb = 0.78 *0.7854*d*d
print("threaded area of bolt is:", Anb)
Asb =0.7854*d*d
print("plane shank area of bolt is:", Asb)
Vdsb= (fub/(1.732* Gamma_mb)*(nn* Anb+ ns* Asb) *10**-3)
print("The value of Vdsb:", Vdsb)
kb1 = e/(3*do)
print("Kbl:", kb1)
kb2 = (pmin/(3*do)) - 0.25
print("Kb2:", kb2)
kb3= fub/fu
print("Kb3:", kb3)
kb4 = 1
print("Kb4:", kb4)
kb_min = (kb1, kb2, kb3, kb4)
print("Kb:", kb1)
Vdpb =(2.5 *kb1*d*t*fu*10**-3)/Gamma_mb
print("Vdpb:", Vdpb)
Vd= min(Vdsb, Vdpb)
print("Vd:", Vd)
N =Tu/Vd
print("Number of bolts requird:", N)
N= float(input("Enter the value of number of
# Check for strength                          bolts:"))
# Criteria 1 Yeilding of Gross Section
Tdg= (Ag*fy *10**-3)/Gamma_mo
print("The value of tensile strength due to yielding of gross section is:", Tdg)
# Criteria 2 Rupture
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Anc = (Lc1-(t/2)-do)*t
print("Net Area of Connecting leg is: (Anc):", Anc)
Ago =(Lo1-(t/2))*t
print("Gross Area of outstand leg is: (Anc):", Ago)
Lc = (N-1)*pmin
print("Le:", Lc)
bs = (0.6*Lc1 )+ (Lo1-t)
print("bs:", bs)
Beta1=((fu/Gamma_m1)*(fy/Gamma_mo))
print("Beta1:",Beta1)
Beta2=(1.4-(0.076 *(fy/fu) *(bs/Lc)* (Lo1/t)))
print("Beta2:",Beta2)
Beta = min(Beta1 , Beta2)
print("Beta:", Beta)
print("Check 1")
if Beta>1.4:
 print("Not Safe")
else:
 print("Safe")
print("Check 2")
if Beta<0.7:
 print("Not Safe")
else:
 print("'Safe")
Tdn =((0.9* fu*Anc)/Gamma_m1) + (Beta *Ago*fy/Gamma_mo)
print("'Tdn:", Tdn)
# Criteria 3 Block Shear
Avg =(pmin* (N-1)+e)* t
print("'Avg:", Avg)
Avn = ((pmin*(N-1)+e)-((N-1)*do+(0.5*do)))*t
print("Avn:", Avn)
Atg= 0.6*Lc1*t
print("Atg:", Atg)
Atn= Atg-(0.5*do)
print("Atn:", Atn)
Tb1 = (((Avg*fy)/(1.732 *Gamma_mo))) +((0.9*
print("Tb1:", Tb1)                                fu*Atn)/Gamma_m1)*10**-3
Tb2 = (((0.9*Avn*fu)/(1.732* Gamma_m1)) + ((Atg*fy)/Gamma_mo))*10**-3
print("Tb2:", Tb2)
Tb = min(Tb1, Tb2)
print("Tb", Tb)
Td = min(Tdg, Tdn, Tb)
print("Td", Td)
if Td>Tu:
 print("SAFE")
else:
 print("Revise the Section")
```

```
Enter the value of ultimate tensile strength:225
Enter the value of yield strength of steel:250
Enter the value of ultimate strength of steel:410
Enter the value of ultimate strength of bolt:400
Enter the value of partial factor of safety Garmma mo:1.1
Enter the value of partial factor of safety Garmma_m1:1.25
Enter the value of partial factor of safety Gamma_mb:1.25
Gross Area Required
The value of gross area required is: 1188.0
Enter the value of gross area of steel is:1257
Enter the length of connected leg:100
Enter the length of outstand leg:65
Entert the value of least thickness: 8
Enter the value of diameter of bolt:20
The diameter of bolt hole is: 22.0
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```
The minimum pitch is: 50.0
Enter the value of edge distance: 33.0
Number of shear planes with threaded intercepting the shear plane:1
Number of shear plane without threads:0
threaded area of bolt is: 245.0448
plane shank area of bolt is: 314.16
The value of Vdsb: 45.273866050808316
Kbl: 0.5
Kb2: 0.5075757575757576
Kb3: 0.975609756097561
Kb4: 1
Kb: 0.5
Vdpb: 65.6
Vd: 45.273866050808316
Number of bolts requird: 4.969754510195687
Enter the value of number of bolts:5
The value of tensile strength due to yielding of gross section is: 285.6818181818182
Net Area of Connecting leg is: (Anc): 592.0
Gross Area of outstand leg is: (Anc): 488.0
Le: 200.0
bs: 117.0
Beta1: 74545.45454545454
Beta2: 1.179733231707317
Beta: 1.179733231707317
Check 1
Safe
Check 2
'Safe
'Tdn: 305601.5402439024
'Avg: 1864.0
Avn: 1072.0
Atg: 480.0
Atn: 469.0
Tb1: 244732.19223900902
Tb2: 291.80130170060886
Tb 291.80130170060886
Td 285.6818181818182
SAFE
```