ASSIGNMENT NO 4 - APPLICATION OF PYTHON IN FIELD OF CONCRETE TECHNOLOGY

Q-1

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fck = float(input(" Enter the value of characteristic compressive strength:"))
# Experimental Determinations
Gca = float(input ("Enter the value of specific gravity of CA:"))
Gfa = float(input("Enter the value of specific gravity of FA:"))
Gc = float(input("Enter the value of specific gravity of Cement:"))
Water_Density = float(input("Enter the value of Water Density:"))
AGG_Size = float(input("Enter the nominal Size of Aggregate:"))
Nature_of_AGG = input("Nature of Aggregates:")
Slump = float(input("Enter the value of workability of concrete:"))
Admixture = input("Type of Admixture:")
Exposure_Condition = input("Exposure Condition:")
Concreting = input("Type of Concreting:")
Zone = int(input("Zone:"))
# Target Mean Strength
sigma = {10:3.5,15:3.5,20: 4,25:4,30: 5,35: 5,40: 5,45: 5,50: 5,55: 5}
ft=fck+sigma[fck]*1.65
print("Target Mean Strength:",ft,"MPa")
# Maximum free Water Cement Ratio
# Reference IS 456: 2000 Table 5
if(Concreting == "Plain"):
 WC_ratio = {"Mild" : 0.6,"Moderate" :0.6,"Severe" :0.5,"Very Severe" :0.45,
             "Extreme":0.4}
else:
 WC_ratio ={"Mild": 0.55,"Moderate":0.5,"Severe" :0.45,"Very Severe" :0.45,
            "Extreme":0.4}
print("W/C Ratio:",WC_ratio[Exposure_Condition] )
WC_ratio = WC_ratio[Exposure_Condition]
# Minimum Cement Content
if(Concreting == "plain"):
 Min_Cement_Content = {"Mild":220,"Moderate": 240,"Severe": 250,
                       "Very Severe": 260,"Extreme": 280}
else:
  Min_Cement_Content = {"Mild":300,"Moderate": 300,"Severe": 320,
                       "Very Severe": 340,"Extreme": 360}

print("Minmum Cement Content:", Min_Cement_Content[Exposure_Condition],"kg/m^3")

# Water Content
Water_Content={10:208,20:186,40:165}
Water_Content = Water_Content[AGG_Size]
if (Slump == 75):
 Water_Content = Water_Content + Water_Content*0.03
elif (Slump == 100):
 Water_Content = Water_Content + Water_Content*0.06
elif (Slump == 125):
 Water_Content = Water_Content + Water_Content*0.09
elif (Slump == 150):
 Water_Content = Water_Content + Water_Content*0.12
elif (Slump == 175):
 Water_Content = Water_Content + Water_Content*0.15
elif (Slump == 200):
 Water_Content = Water_Content + Water_Content*0.18
if (Nature_of_AGG == "Sub-Angular"):
 Water_Content = Water_Content - 10
elif (Nature_of_AGG == "Gravel"):
 Water_Content = Water_Content - 20
elif (Nature_of_AGG == "Round"):
 Water_Content = Water_Content - 25
if (Admixture == "Plastisizer"):
 Water_Content = Water_Content-(0.1*Water_Content)
elif (Admixture=="Super-plastisizer"):
 Water_Content = Water_Content-(0.2*Water_Content)
print("Water Content:", Water_Content, "kg/m^3")
# Cement Content
Cement_Content = Water_Content/WC_ratio
print("CementContent:", Cement_Content, "kg/m^3")
print("As Per IS 456:2000, Maximum allowed Cement Content is 450 kg/m^3")

if (Cement_Content< 450):
  Cement_Content = Cement_Content
else:
  Cement_Content = 450

if Cement_Content< 450:
  print("Safe")
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# Volume Calculations
Vol_Cement = Cement_Content/(Gc*Water_Density)
print("Volume of Cemnet:",Vol_Cement,"m^3")
Vol_Water = Water_Content/Water_Density
print("Volume of Water:",Vol_Water,"m^3")
Vol_AGG= 1-Vol_Water-Vol_Cement
print("Volume of Course Aggregates and Fine Aggregates: ",Vol_AGG, "m^3")
Zone_ID ={}
Zone_ID[1]= {10:0.44, 20:0.60, 40:0.69}
Zone_ID[2]={10:0.46, 20:0.62, 40:0.71}
Zone_ID[3]={10:0.48, 20:0.64, 40:0.73}
Zone_ID[4]={10:0.5, 20:0.66, 40:0.75}
Fraction = Zone_ID[Zone] [AGG_Size]
if (WC_ratio==0.5) :
  Fraction=Fraction
elif (WC_ratio==0.45):
  Fraction=Fraction+(0.01*Fraction)
elif (WC_ratio==0.4):
  Fraction=Fraction+(0.02 * Fraction)
elif (WC_ratio==0.55):
  Fraction=Fraction-(0.01*Fraction)
elif (WC_ratio==0.60):
  Fraction=Fraction-(0.02*Fraction)

print("Course Aggregate fraction:", Fraction)
Vol_CA = Vol_AGG*Fraction
print ("Volume of Course Aggregate:", Vol_CA,"m^3")

Vol_FA = Vol_AGG-Vol_CA
print ("Volume of Fine Aggregate: ", Vol_FA,"m^3")

Mass_CA= Vol_CA*Gca* Water_Density
print ("Mass of Course Aggregates: ", Mass_CA, "Kg/m^3")

Mass_FA = Vol_FA*Gfa*Water_Density
print ("Mass of Fine Aggregates:", Mass_FA, "kg/m^3")

# Ratios
print("Weight Batching")
print(Cement_Content/Cement_Content,":", Mass_FA/Cement_Content,":",
      Mass_CA/Cement_Content,":",Water_Content/Cement_Content)
print("Volume Batching:")
print(Vol_Cement/Vol_Cement,":",Vol_FA/Vol_Cement,":",Vol_CA/Vol_Cement,":",Vol_Water/Vol_Cement)
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 Enter the value of characteristic compressive strength:40
Enter the value of specific gravity of CA:74
Enter the value of specific gravity of FA:74
Enter the value of specific gravity of Cement:3.15
Enter the value of Water Density:1000
Enter the nominal Size of Aggregate:20
Nature of Aggregates:Sub-Angular
Enter the value of workability of concrete:100
Type of Admixture:Super-Plastisizer
Exposure Condition:Severe
Type of Concreting:Reinforced
Zone:1
Target Mean Strength: 48.25 MPa
W/C Ratio: 0.45
Minmum Cement Content: 320 kg/m^3
Water Content: 187.16 kg/m^3
CementContent: 415.9111111111111 kg/m^3
As Per IS 456:2000, Maximum allowed Cement Content is 450 kg/m^3
Safe
Volume of Cemnet: 0.1320352733686067 m^3
Volume of Water: 0.18716 m^3
Volume of Course Aggregates and Fine Aggregates:  0.6808047266313932 m^3
Course Aggregate fraction: 0.606
Volume of Course Aggregate: 0.4125676643386243 m^3
Volume of Fine Aggregate:  0.26823706229276895 m^3
Mass of Course Aggregates:  30530.007161058198 Kg/m^3
Mass of Fine Aggregates: 19849.542609664903 kg/m^3
Weight Batching
1.0 : 47.72544440237875 : 73.40512514680589 : 0.45
Volume Batching:
1.0 : 2.0315560792904463 : 3.1246776244924126 : 1.4174999999999998
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