#Roshan Chawan 22CV013

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\_Table = {

10:208,

20:186,

40:165

}

Water\_Content = Water\_Content\_Table[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 ("Cement Content:", 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 = 450

if Cement\_Content < 450:

    print ("Safe")

# Volume Calculations

Vol\_Cement = Cement\_Content/(Gc\*Water\_Density)

print ("Volume of Cement: ", 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)

Output:-

Enter the value of characteristic compressive strength:40

Enter the value of specific gravity of CA: 2.74

Enter the value of specific gravity of FA: 2.74

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

Cement Content: 415.9111111111111 kg/m^3

As Per IS 456:2000, Maximum allowed Cement Content is 450 kg/m^3

Safe

Volume of Cement: 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: 1130.4354002878308 Kg/m^3

Mass of Fine Aggregates: 734.969550682187 kg/m^3

Weight Batching

1.0 1.7671313197637537 : 2.7179735527330835 : 0.45

Volume Batching:

1.0 2.0315560792904463 3.1246776244924126 1.4174999999999998