ASSIGNMENT 3

Q1

```
# Program to calculate the length of transition curve
V = int(input("Enter the value of design speed (kmph): "))
R = int(input("Enter the value of Radius of curvature (m): "))
N = int(input("Enter the value of slope (e.g., 150 for 1 in 150): "))
W = float(input("Enter the width of road including extra widening (m): "))
emax = float(input("Enter the max allowable superelevation (plain terrain): "))
# Calculate actual super elevation
ecal = (V * V) / (225 * R)
print("The value of Super elevation:", ecal)
# Use the minimum of calculated or allowable
if ecal < emax:
e = ecal
else:
   e = emax
# Length of transition curve
Ls = (e * N * W) / 2
print("The length of transition curve is:", Ls, "m")
```

OUTPUT-

```
Enter the value of design speed (kmph): 65
Enter the value of Radius of curvature (m): 220
Enter the value of slope (e.g., 150 for 1 in 150): 150
Enter the width of road including extra widening (m): 7.5
Enter the max allowable superelevation (plain terrain): 0.07
The value of Super elevation: 0.08535353535353535
```

The length of transition curve is: 39.37500000000001 m

Q2

```
# Program to calculate pavement thickness from EWL and Traffic Index
import numpy as np
R = int(input("Enter Constant R: "))
C = int(input("Enter Constant C: "))
A = int(input("Enter number of EWL Constants: "))
B = int(input("Enter number of AADT values: "))
EWL_Constant = []
AADT = []
for i in range(A):
   val = float(input(f"Enter EWL Constant {i+1}: "))
   EWL_Constant.append(val)
for j in range(B):
   val = float(input(f"Enter AADT {j+1}: "))
   AADT.append(val)
product = np.dot(EWL_Constant, AADT)
print("Total EWL:", product)
EWL_10_years = product * 1.6
print("EWL after 10 years:", EWL_10_years)
TI = 1.35 * ((EWL_10_years + (product / 2)) ** 0.11)
print("Traffic Index:", TI)
# Pavement Thickness formula
Thickness = 0.166 * TI * ((90 - R) / (C ** 0.2))
print("Pavement Thickness:", Thickness, "cm")
```

OUTPUT-

Enter Constant R: 48

Enter Constant C: 16

Enter number of EWL Constants: 4

Enter number of AADT values: 4

Enter EWL Constant 1: 330

Enter EWL Constant 2: 1070

Enter EWL Constant 3: 2460

Enter EWL Constant 4: 4620

Enter AADT 1: 3750

Enter AADT 2: 470

Enter AADT 3: 320

Enter AADT 4: 120

Total EWL: 3082000.0

EWL after 10 years: 4931200.0

Traffic Index: 7.577910657490486

Pavement Thickness: 30.344701003916345 cm

Q3

```
# Program to calculate thickness of pavement layers using CBR values
import math
P = float(input("Enter wheel load (kg): "))
p = float(input("Enter tyre pressure (kg/cm^2): "))
M = int(input("Enter total number of pavement layers: "))
pi = 3.14159
for i in range(M):
    CBR_value = float(input(f"Enter CBR (%) for layer {i+1}: "))
    T = math.sqrt((1.75 * P) / CBR_value - (P / (p * pi)))
    print(f"Thickness above this layer: {T:.2f} cm")
print("Note: Given bitumen layer thickness is 4 cm")
```

OUTPUT-

Enter wheel load (kg): 4085

Enter tyre pressure (kg/cm^2): 7

Enter total number of pavement layers: 3

Enter CBR (%) for layer 1: 4.38

Thickness above this layer: 38.03 cm

Enter CBR (%) for layer 2: 6

Thickness above this layer: 31.71 cm

Enter CBR (%) for layer 3: 12

Thickness above this layer: 20.25 cm

Note: Given bitumen layer thickness is 4 cm