SADS-II problem-2 **Date: 31-01-2024**

The data of weight, height and chest circumference of 15 UG students selected from the population of 50 UG students are given below.

Weight(kg)	Height(cm)	Chest circumference(cm)
60	155	36
61	158	45
54	155	39
49	146	34
63	165	46
69	170	49
67	170	46
50	150	39
57	153	45
55	151	40
59	155	41
67	171	47
63	161	41
49	150	39
50	152	40

Find the sample mean vector $\bar{X}$, sample variance covariance matrix S and sample correlation matrix r of the above data.

Result:-

The sample mean vector:-

```
  # to make the matrix
> x=c(60,61,54,49,63,69,67,50,57,55,59,67,63,49,50)
> y=c(155,158,155,146,165,170,170,150,153,151,155,171,161,150,152)
> z=c(36,45,39,34,46,49,46,39,45,40,41,47,41,39,40)
> # TO make the column matrix
> Mtr=cbind(x,y,z)
> Mtr
         x   y  z
 [1,] 60 155 36
 [2,] 61 158 45
 [3,] 54 155 39
 [4,] 49 146 34
 [5,] 63 165 46
 [6,] 69 170 49
 [7,] 67 170 46
 [8,] 50 150 39
 [9,] 57 153 45
[10,] 55 151 40
[11,] 59 155 41
[12,] 67 171 47
[13,] 63 161 41
[14,] 49 150 39
[15,] 50 152 40
> # For finding the sample mean
> sample_mean=colMeans(Mtr)
```

```
> sample_mean
        x        y        z
 58.2000 157.4667  41.8000
> # For finding the covarience matrix
> covarience=cov(Mtr)
> covarience
           x        y        z
x 47.31429 52.11429 23.11429
y 52.11429 65.69524 28.95714
z 23.11429 28.95714 18.60000
> # To finding the correlation matrix
> correlation=cor(Mtr)
> correlation
             x         y         z
x 1.0000000 0.9347462 0.7791622
y 0.9347462 1.0000000 0.8283851
z 0.7791622 0.8283851 1.0000000
> # For sample mean
> sample_mean=colMeans(Mtr)
> sample_mean
        x        y        z
 58.2000 157.4667  41.8000
> # For variance covariance matrix
> covarience=cov(Mtr)
> covarience
           x        y        z
x 47.31429 52.11429 23.11429
y 52.11429 65.69524 28.95714
z 23.11429 28.95714 18.60000
> # for finding the correlation
> correlation=cor(Mtr)
> correlation
             x         y         z
x 1.0000000 0.9347462 0.7791622
y 0.9347462 1.0000000 0.8283851
z 0.7791622 0.8283851 1.0000000
  #for finding the diagonal and finding diagonal matrix
> Mat=diag(covarience)
> Mat
        x        y        z
47.31429 65.69524 18.60000
> v=diag(Mat,nrow=3,ncol=3,names=true)
> v
           [,1]     [,2] [,3]
[1,] 47.31429  0.00000  0.0
[2,]  0.00000 65.69524  0.0
[3,]  0.00000  0.00000 18.6
> # For finding the square root and inverse of matrix
> squa_root=sqrt(v)
> squa_root
           [,1]    [,2]     [,3]
[1,] 6.878538 0.00000 0.000000
[2,] 0.000000 8.10526 0.000000
[3,] 0.000000 0.00000 4.312772
> Inverse_matrix=solve(squa_root)
> Inverse_matrix
             [,1]      [,2]      [,3]
[1,] 0.1453797 0.0000000 0.0000000
[2,] 0.0000000 0.1233767 0.0000000
[3,] 0.0000000 0.0000000 0.2318694



> # To cheack for the correlation
> Rn=Inverse_matrix %*%covarience%*%Inverse_matrix
> Rn
```

```
          [,1]      [,2]      [,3]
[1,] 1.0000000 0.9347462 0.7791622
[2,] 0.9347462 1.0000000 0.8283851
[3,] 0.7791622 0.8283851 1.0000000
>
```