

MonteCarlo Simulation Assigment : 06

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Ques.1)

- Value of X1, X2 can be generated using the multivariate formula of:

$$X1 = (\mu)_1 + (\sigma)_1 * Z1$$

$$X2 = (\mu)_2 + (\rho) * (\sigma)_2 * Z1 + \sqrt{1 - (\rho)^2} * (\sigma)_2 * Z2$$

Where:

μ represents the mean vector and σ corresponds to the respective variance value, ρ is the correlation coefficient.

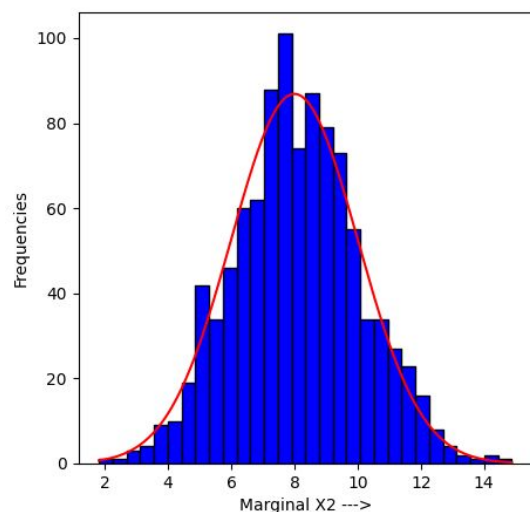
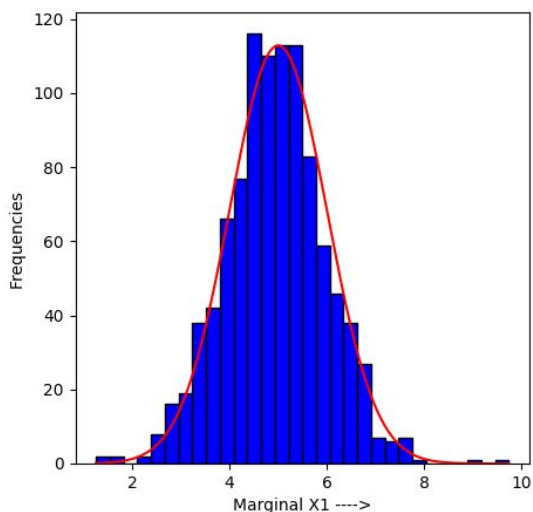
Z1, Z2 are 2 univariate normal distributions.

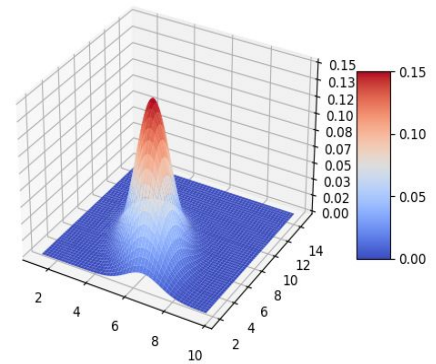
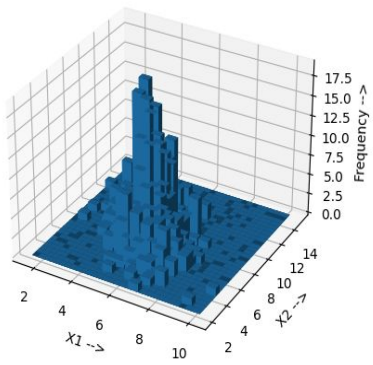
- X1 and X2 can be generated normally by generating Z1, Z2 through Margaslia, and Bray generating methods, and then correspondingly X1 and X2 are been generated.

Ques 2,3.)

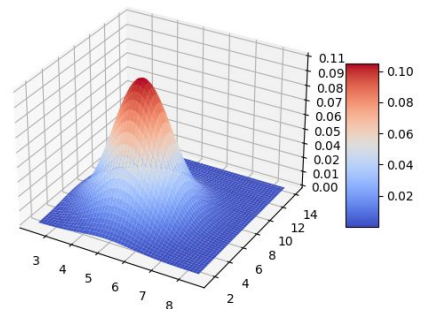
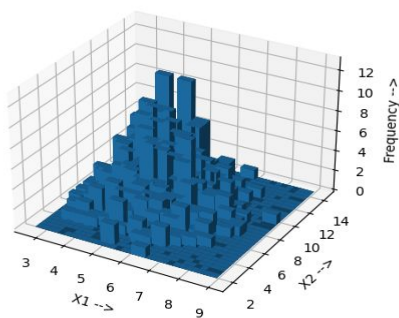
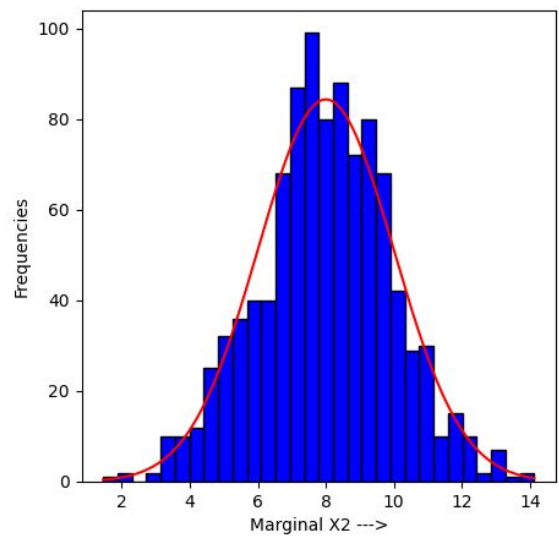
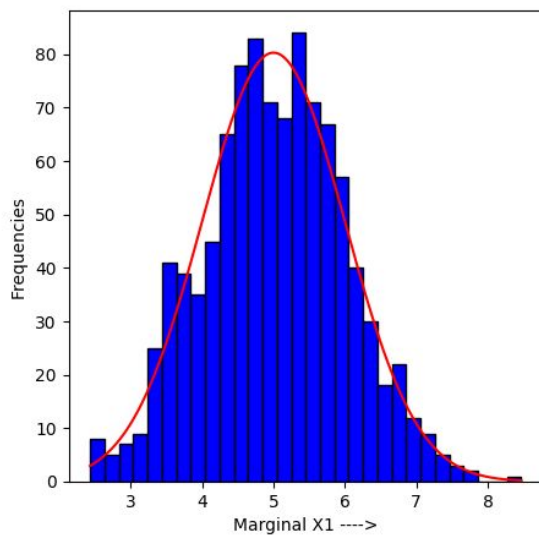
- We are been given 4 values of ρ to generate the corresponding graphs.

1. $\rho = -0.5$

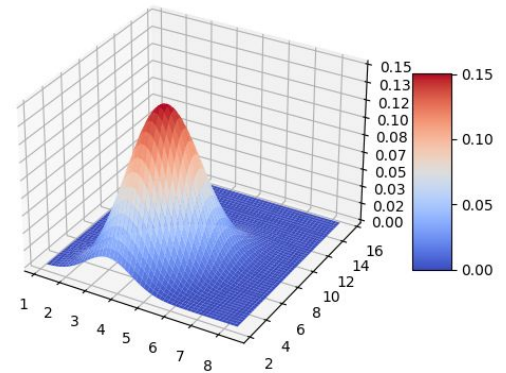
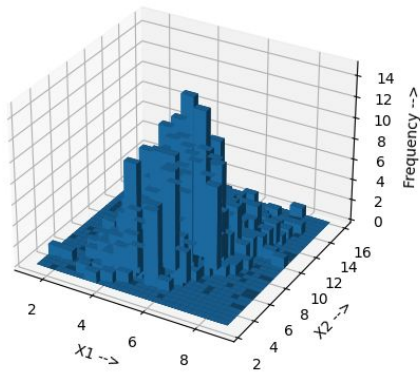
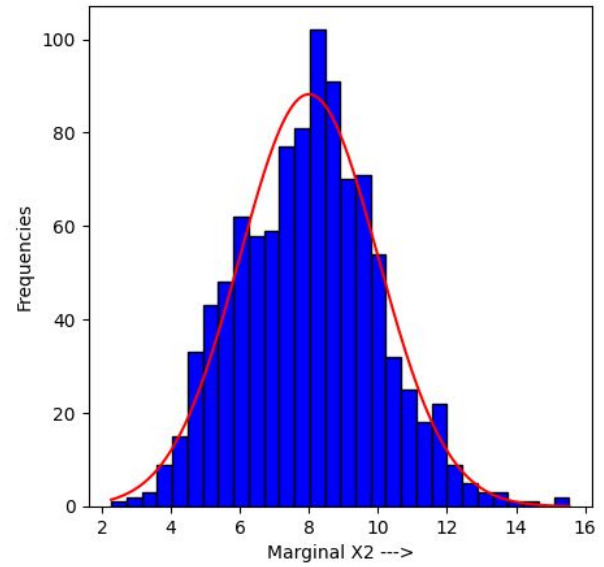
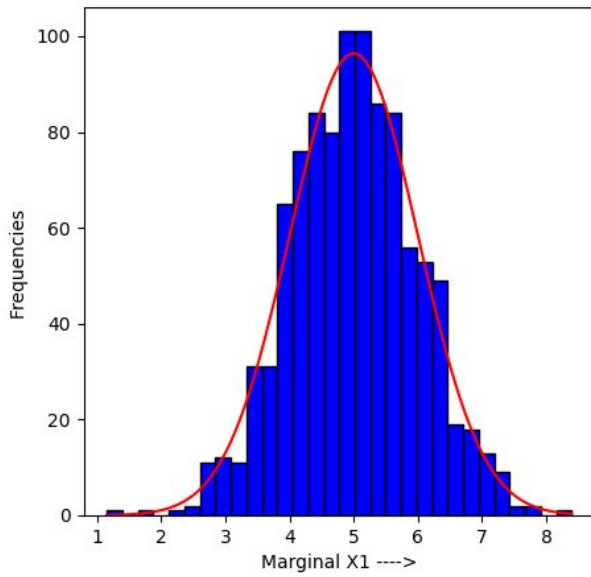




2. a = 0:

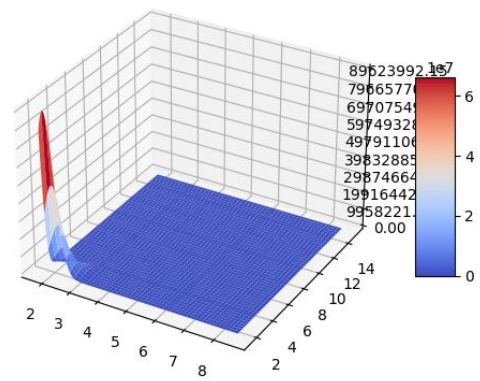
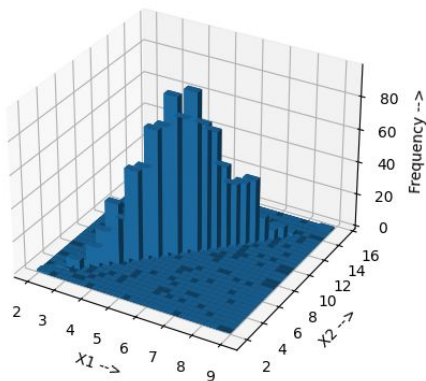
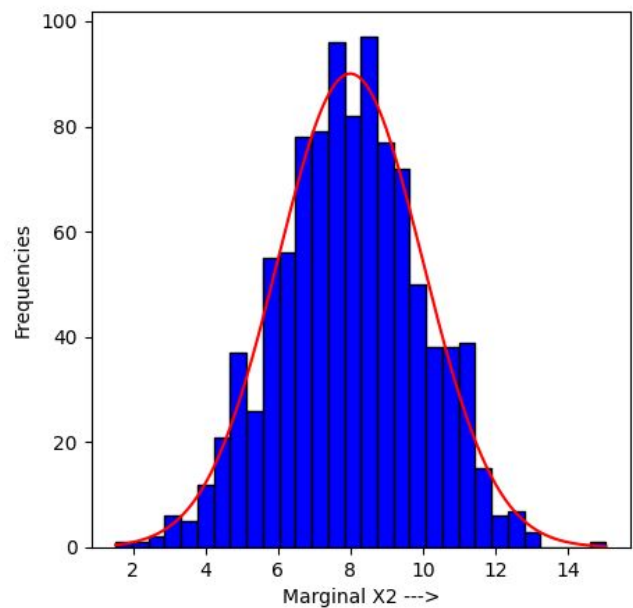
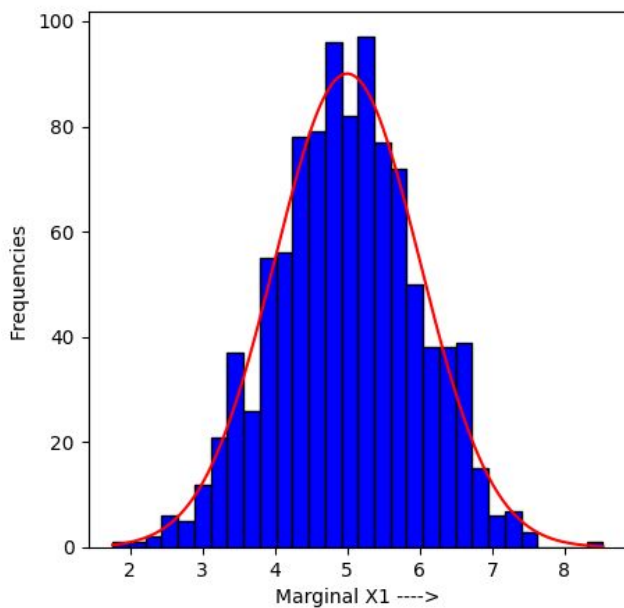


3. a = 0.5:



4. a = 1:

-> This case is having the determinant value equal to 0. Hence a closer value of $a = 0.95$ is being taken to draw the plots respectively. The **Variance-Covariance** matrix will become singular in this case. Hence, to predict the actual distribution, some approx value closer to $a = 1$ is been taken.



-> The terminal output is been shown in the below picture:

```
naman-ubuntu-20@naman-ubuntu-20:~/Desktop/MonteLab6$ python3 180123029_q.py
a= -0.5
3D Histogram for a= -0.5
Expected surface 3d for a = -0.5
a= 0
3D Histogram for a= 0
Expected surface 3d for a = 0
a= 0.5
3D Histogram for a= 0.5
Expected surface 3d for a = 0.5
a= 1
3D Histogram for a= 1
Expected surface 3d for a = 0.95
naman-ubuntu-20@naman-ubuntu-20:~/Desktop/MonteLab6$
```