EXPERIMENT NO: 11

Random Sampling and Sampling Distribution:

AIM:

To explore random sampling from a population and understand the concept of sampling distribution using Python in Jupyter Notebook.

ALGORITHM:

1. Import required libraries.
2. Generate a population using a normal distribution.
3. Draw random samples and compute their means.
4. Plot histogram of sample means (sampling distribution).
5. Compare with population and show Central Limit Theorem effect.

PROGRAM:

[1]:
```
import numpy as np
import matplotlib.pyplot as plt
```

[2]:
```
population_mean = 50
population_std = 10
population_size = 100000
population = np.random.normal(population_mean, population_std, population_size)
```

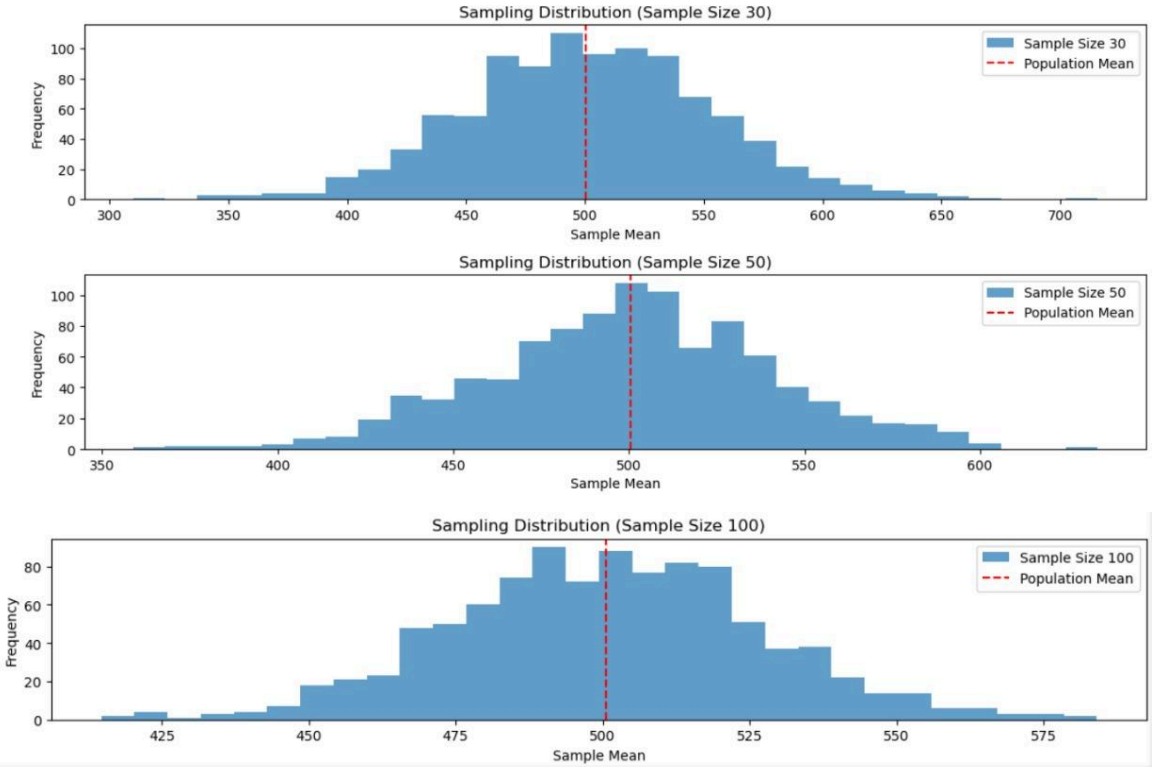
[4]:
```
import numpy as np

sample_sizes = [30, 50, 100]
num_samples = 1000
sample_means = {}
population = np.arange(1, 1001)

for size in sample_sizes:
    sample_means[size] = []
    for _ in range(num_samples):
        sample = np.random.choice(population, size=size, replace=False)
        sample_means[size].append(np.mean(sample))
```

[8]:
```
import matplotlib.pyplot as plt

plt.figure(figsize=(12, 8))
for i, size in enumerate(sample_sizes):
    plt.subplot(len(sample_sizes), 1, i+1)
    plt.hist(sample_means[size], bins=30, alpha=0.7, label=f'Sample Size {size}')
    plt.axvline(np.mean(population), color='red', linestyle='dashed', linewidth=1.5, label='Population Mean')
    plt.title(f'Sampling Distribution (Sample Size {size})')
    plt.xlabel('Sample Mean')
    plt.ylabel('Frequency')
    plt.legend()
plt.tight_layout()
```



RESULT:

Thus the python code to explore random sampling from a population and understand the concept of sampling distribution using Python in Jupyter Notebook is executed.