DAV Question Bank

UNIT-1

1. How do you explicitly specify the data type of a NumPy array as float32?
2. How do you create a 2x3 array filled with zeros using NumPy?
3. What happens if you use negative indexing in a NumPy array?
4. How do you extract a 2x2 subarray from the top-left corner of a 2D array arr?
5. How do you reshape a 1D array of 6 elements into a 2x3 array?
6. How do you concatenate two 1D arrays arr1 and arr2 vertically?
7. How do you split a 1D array into 3 equal parts?
8. What is a universal function (ufunc) in NumPy?
9. How do you compute the element-wise square root of an array arr?
10. How do you compute the sum of all elements in a 2D array arr?
11. What does np.mean(arr) do?
12. Can you add a 1D array of shape (3,) to a 2D array of shape (2, 3)? Justify your answer.
13. How do you create a boolean array where elements of arr are greater than 5?
14. How do you select elements at indices 1, 3, and 5 from a 1D array arr?
15. Differentiate np.sort() and np.argsort() with an example.
16. How do you find the smallest 3 elements in an array arr?
17. How do you create a structured array with fields name (string) and age (int)?
18. How do you access the age field of a structured array arr?
19. What is a record array in NumPy?
20. Given: myArray = np.array([[11,12,13], [14,15,16], [17,18,19]])
21. Write a Python code snippet to perform the following operations:
    i) Get a subarray of the first row and the first 2 columns.
    ii) Change all elements in the 1 st and 2 nd rows to '0'.
22. Write a Python function that takes a NumPy array of random integers and an integer k as input, and returns the k smallest elements of the array. Test your function with an example array.
23. Explain the difference between np.zeros(), np.ones(), and np.empty(). Provide an example of each.
24. Given a 2D array arr = np.array([[1, 2, 3], [4, 5, 6], [7, 8, 9]]), explain how to extract the following:
    a) The second row. b) The third column. c) The subarray [[2, 3], [5, 6]].
    d) The last element.
25. Given two arrays arr1 = np.array([1, 2, 3]) and arr2 = np.array([4, 5, 6]), explain how to:
    a) Reshape arr1 into a 3x1 array.
    b) Concatenate arr1 and arr2 vertically.
    c) Concatenate arr1 and arr2 horizontally.
    d) Stack arr1 and arr2 along a new axis.

26. Explain the purpose of universal functions (ufuncs) in NumPyancy. Provide examples of three ufuncs and describe their functionality.
27. Explain NumPy broadcasting rules. Describe how broadcasting is applied to perform the following operation:
    i) a = np.arange(3).reshape((3, 1))
    ii) b = np.arange(3)
    iii) print(a+b)
28. Given an array arr = np.array([1, 2, 3, 4, 5]), explain how to:
    a) Create a boolean mask for elements greater than 3.
    b) Use the mask to filter the array.
    c) Count the number of elements greater than 3.
    d) Replace elements greater than 3 with 0.
29. Explain fancy indexing in NumPy with an example. How is it different from regular indexing?
30. Given arr = np.array([[5, 6, 7], [8, 9, 10], [11, 12, 13]])
    Write the code to perform the following operations using Fancy Indexing:
    i) Extract the elements at positions (0,1), (1,0), and (2,2)
    ii) Extract a subarray consisting of the first two rows and the last two columns.
31. Given an array arr = np.array([3, 1, 4, 2, 5]), explain how to:
    a) Sort the array in ascending order.
    fb) Get the indices that would sort the array.
    c) Perform partial sorting to find the smallest 3 elements.
    d) Get the indices of the smallest 3 elements.
32. What is a record array in NumPy? How is it different from a structured array?

UNIT-2

1. Explain the difference between a Pandas Series and a DataFrame. Provide an example of how you would create each from a Python list and a dictionary.
2. Compare and contrast the use of `.loc`, `.iloc`, and direct indexing in Pandas. Provide examples of when each method is most appropriate.
3. Given a DataFrame, explain how you would select:
    a) A single column.
    b) Multiple rows based on a condition.
    c) A subset of rows and columns using `.loc`.
    d) A specific cell using `.iloc`.
4. Discuss the various methods for handling missing data in Pandas. Provide examples of using `dropna()`afnd `fillna()`
5. Explain how you would identify and handle missing values in a DataFrame. Provide examples of filling missing values with a specific value, the mean of the column, and using forward fill.
6. What is hierarchical indexing (MultiIndex) in Pandas? Explain how you would create a DataFrame with a MultiIndex and access data from it.
7. Describe the purpose of the `stack()` and `unstack()` methods in Pandas. Provide an example of how you would use these methods to reshape a DataFrame.

8. Explain the concept of index alignment in Pandas. What happens when you perform operations (e.g., addition) between two Series with different indices? Provide an example.
9. How do you add a Series to a DataFrame column-wise and row-wise? Explain the differences and provide examples.**
10. Create a Series data structure from the given list L1 = [1, None, 3, 4] and apply the isnull(), notnull(), dropna(), fillna(0)
11. Differentiate loc() and iloc() methods. Given the following DataFrame representing student details. Use loc[] and iloc[] to retrieve the Marks for 'Divya'.

```
import pandas as pd
data = {'Student': ['Arun', 'Bhavya', 'Chirag', 'Divya'],
        'Age': [20, 22, 21, 23],
        'Marks': [85, 90, 88, 95]}
df = pd.DataFrame(data, index=['S1', 'S2', 'S3', 'S4'])
```

12. Write the output of the following code snippet that uses a Multi-Index DataFrame:

```
import pandas as pd
index = pd.MultiIndex.from_tuples([('A', 1), ('A', 2), ('B', 1), ('B', 2)], names=['Letter', 'Number'])
data = pd.DataFrame({'Value': [10, 20, 30, 40]}, index=index)
print(data)
print(data.loc['B'])
```

UNIT-3

1. Write the syntax of the concat() function in pandas and explain any two parameters.
2. What is the difference between pd.concat() and df.append() in Pandas? Provide an example of when you would use each.
3. How do you concatenate two DataFrames vertically and horizontally using pd.concat()? Provide examples for each case.
4. Explain the difference between an inner join and a left join in Pandas. Provide an example of how you would perform each using pd.merge().
5. How do you merge two DataFrames on their indices? Provide an example and explain the result.
6. What is the purpose of the groupby() function in Pandas? Provide an example of how you would use it to calculate the mean of each group.
7. How do you apply multiple aggregation functions (e.g., sum, mean, count) to a grouped DataFrame? Provide an example.
8. How do you create a pivot table in Pandas? Provide an example and explain the purpose of the values, index, columns, and aggfunc parameters.
9. Write a python code snippet to merge the following two data frames and retrieve the employee record whose salary is greater than 10000

   Date Frame df1:

	Employee	Group
0	Bob	Accounting
1	Jake	Engineering
2	Lisa	Engineering
3	Sue	HR

Data Frame df2:

	Name	Salary
0	Bob	7000
1	Jake	8000
2	Lisa	120000
3	Sue	9000

10. Perform an inner join between the following DataFrames df1 and df2 on both the ID and Category columns.

```
df1 = pd.DataFrame({'ID': [1, 2, 3], 'Category': ['A', 'B', 'A'], 'Value': [100, 200, 300]})
df2 = pd.DataFrame({'ID': [2, 3, 4], 'Category': ['B', 'A', 'C'], 'Amount': [50, 75, 125]})
```