NumPy Assignment Questions (Intermediate to Advanced)

1. Create a 2D array of shape (6,8) with random integers between 50 and 150.

2. Create a 3D array of zeros with shape (4,3,5).

3. Generate an array of 20 evenly spaced numbers between 5 and 50.

4. Convert a nested Python list into a NumPy array and check its shape and dtype.

5. Create a 2D array of size (5,5) filled with the border as 1 and the inside as 0.

6. Generate a 10×10 matrix with random numbers and replace its diagonal with 7.

7. Create a 3×3 identity matrix and then multiply it with a random 3×3 matrix.

8. Create an array of 100 random floats and round each to two decimal places.

9. Reshape a 1D array of 60 elements into shape (5,4,3) without changing the data.

10. Stack two arrays of shape (5,3) horizontally and vertically.

11. Extract all even numbers from a given 1D NumPy array.

12. Replace all negative numbers in an array with zero.

13. Given two arrays A and B, find indices where A > B.

14. Mask all values of an array that lie within a specified range (inclusive).

15. Select every 3rd column from a 2D array.

16. Swap the first and last rows of a 2D array.

17. Extract rows from a 2D array where the sum of row elements > 100.

18. Create a boolean mask for all elements greater than the mean of the array.

19. Given a matrix, extract all elements greater than the column-wise mean.

20. Split a 6×6 matrix into four equal (3×3) submatrices.

21. Compute mean, median, variance, and standard deviation of a random array.

22. Normalize a 2D array to the range [0,1] using min–max normalization.

23. Standardize a 2D array using z-score normalization.

24. Compute cumulative sum and cumulative product of an array.

25. Find correlation coefficients between columns of a 2D array.

26. Generate a 1D array of 50 numbers and calculate its moving average using stride tricks.

27. Compute pairwise Euclidean distances between rows of a matrix using broadcasting.

28. Calculate the dot product of two vectors.

29. Compute the row-wise sum and column-wise sum of a 2D array.

30. Find the most frequent element in a NumPy array.

31. Using broadcasting, generate a 10×10 multiplication table.

32. Add a 1D array to each row of a 2D array using broadcasting.

33. Subtract the column-wise mean from each column without loops.

34. Create a 2D array where each element is the sum of its row and column indices.

35. Vectorize a custom function to apply on each element of an array.

36. Using broadcasting, normalize each row of a 2D array individually.

37. Create a 3D array and slice it to extract every second layer.

38. Compute the outer product of two 1D arrays.

39. Implement one-hot encoding of integer labels using NumPy.

40. Replace all NaN values in a 2D array with column means.

41. Solve a system of linear equations using numpy.linalg.solve.

42. Compute eigenvalues and eigenvectors of a 3×3 matrix.

43. Find the determinant of a square matrix.

44. Find the rank of a matrix.

45. Compute the inverse of a non-singular matrix.

46. Perform matrix multiplication using both @ operator and numpy.dot.

47. Implement a simple Principal Component Analysis (PCA) using only NumPy.

48. Generate a symmetric matrix and verify it is symmetric.

49. Perform QR decomposition of a matrix using numpy.linalg.qr.

50. Compute the Singular Value Decomposition (SVD) of a matrix using numpy.linalg.svd.