PW SKILLS

Assignments

Question 1.1: Write the Answer to these questions.
Note: Give at least one example for each of the questions.

- What is the difference between static and dynamic variables in Python?
- Explain the purpose of "pop","popitem","clear()" in a dictionary with suitable examples.
- What do you mean by FrozenSet? Explain it with suitable examples.
- Differentiate between mutable and immutable data types in Python and give examples of mutable and immutable data types.
- What is __init__?Explain with an example.
- What is docstring in Python?Explain with an example.
- What are unit tests in Python?
- What is break, continue and pass in Python?
- What is the use of self in Python?
- What are global, protected and private attributes in Python?
- What are modules and packages in Python?
- What are lists and tuples? What is the key difference between the two?
- What is an Interpreted language & dynamically typed language?Write 5 differences between them.
- What are Dict and List comprehensions?
- What are decorators in Python? Explain it with an example.Write down its use cases.
- How is memory managed in Python?
- What is lambda in Python? Why is it used?
- Explain split() and join() functions in Python?
- What are iterators , iterable & generators in Python?
- What is the difference between xrange and range in Python?
- Pillars of Oops.
- How will you check if a class is a child of another class?
- How does inheritance work in python? Explain all types of inheritance with an example.
- What is encapsulation? Explain it with an example.
- What is polymorphism? Explain it with an example.

Question 1. 2. Which of the following identifier names are invalid and why?

a) Serial_no.
b) 1st_Room
c) Hundred$
d) Total_Marks
e) total-Marks
f) Total Marks
g) True
h) _Percentag

Question 1.3.

name = ["Mohan", "dash", "karam", "chandra","gandhi","Bapu"]
do the following operations in this list;

a) add an element "freedom_fighter" in this list at the 0th index.

b) find the output of the following ,and explain how?

```
name = [“freedomFighter”,"Bapuji","MOhan" "dash", "karam",
"chandra","gandhi"]
length1=len((name[-len(name)+1:-1:2]))
length2=len((name[-len(name)+1:-1]))
print(length1+length2)
```

c) add two more elements in the name ["NetaJi","Bose"] at the end of the list.

d) what will be the value of temp:

```
name = ["Bapuji", "dash", "karam", "chandra","gandi","Mohan"]
temp=name[-1]
name[-1]=name[0]
name[0]=temp
print(name)
```

Question 1.4.Find the output of the following.

```
animal = ['Human','cat','mat','cat','rat','Human', 'Lion']
print(animal.count('Human'))
print(animal.index('rat'))
print(len(animal))
```

Question 1.5. tuple1=(10,20,"Apple",3.4,'a',["master","ji"],("sita","geeta",22),[{"roll_no":1}, {"name":"Navneet"}])

a)print(len(tuple1))
b)print(tuple1[-1][-1]["name"])
c)fetch the value of roll_no from this tuple.
d)print(tuple1[-3][1])
e)fetch the element "22" from this tuple.

1.6. Write a program to display the appropriate message as per the color of signal(RED-Stop/Yellow-Stay/ Green-Go) at the road crossing.

1.7. Write a program to create a simple calculator performing only four basic operations(+,-,/,*) .

1.8. Write a program to find the larger of the three pre-specified numbers using ternary operators.

1.9. Write a program to find the factors of a whole number using a while loop.

1.10. Write a program to find the sum of all the positive numbers entered by the user. As soon as the user enters a negative number, stop taking in any further input from the user and display the sum .

1.11. Write a program to find prime numbers between 2 to 100 using nested for loops.

1.12. Write the programs for the following:

- Accept the marks of the student in five major subjects and display the same.
- Calculate the sum of the marks of all subjects.Divide the total marks by number of subjects (i.e. 5), calculate percentage = total marks/5 and display the percentage.
- Find the grade of the student as per the following criteria . Hint: Use Match & case for this.:

Criteria	Grade
percentage > 85	A
percentage < 85 && percentage >= 75	B
percentage < 75 && percentage >= 50	C
percentage > 30 && percentage <= 50	D
percentage <30	Reappear

1.13. Write a program for VIBGYOR Spectrum based on their Wavelength using.
Wavelength Range:

COLOR	WAVELENGTH (nm)
Violet	400.0-440.0
Indigo	440.0-460.0
Blue	460.0-500.0
Green	500.0-570.0
Yellow	570.0-590.0
Orange	590.0-620.0
Red	620.0-720.0

1.14.Consider the gravitational interactions between the Earth, Moon, and Sun in our solar system.
Given:

```
mass_earth = 5.972e24  # Mass of Earth in kilograms
mass_moon = 7.34767309e22  # Mass of Moon in kilograms
mass_sun = 1.989e30  # Mass of Sun in kilograms

distance_earth_sun = 1.496e11  # Average distance between Earth and Sun in meters
distance_moon_earth = 3.844e8  # Average distance between Moon and Earth in meters
```

Tasks:

- Calculate the gravitational force between the Earth and the Sun.
- Calculate the gravitational force between the Moon and the Earth.
- Compare the calculated forces to determine which gravitational force is stronger.
- Explain which celestial body (Earth or Moon) is more attracted to the other based on the comparison.

2. Design and implement a Python program for managing student information using object-oriented principles. Create a class called `Student` with encapsulated attributes for name, age, and roll number. Implement getter and setter methods for these attributes. Additionally, provide methods to display student information and update student details.

Tasks:

- Define the `Student` class with encapsulated attributes.
- Implement getter and setter methods for the attributes.
- Write methods to display student information and update details.
- Create instances of the `Student` class and test the implemented functionality.

3.Develop a Python program for managing library resources efficiently. Design a class named `LibraryBook` with attributes like book name, author, and availability status. Implement methods for borrowing and returning books while ensuring proper encapsulation of attributes.

Tasks:

- 1. Create the `LibraryBook` class with encapsulated attributes.
- 2. Implement methods for borrowing and returning books.
- 3. Ensure proper encapsulation to protect book details.
- 4. Test the borrowing and returning functionality with sample data.

4.Create a simple banking system using object-oriented concepts in Python. Design classes representing different types of bank accounts such as savings and checking. Implement methods for deposit, withdraw, and balance inquiry. Utilize inheritance to manage different account types efficiently.

Tasks:

- 1. Define base class(es) for bank accounts with common attributes and methods.
- 2. Implement subclasses for specific account types (e.g., SavingsAccount, CheckingAccount).
- 3. Provide methods for deposit, withdraw, and balance inquiry in each subclass.
- 4. Test the banking system by creating instances of different account types and performing transactions.

5.Write a Python program that models different animals and their sounds. Design a base class called `Animal` with a method `make_sound()`. Create subclasses like `Dog` and `Cat` that override the `make_sound()` method to produce appropriate sounds.

Tasks:

- 1. Define the `Animal` class with a method `make_sound()`.
- 2. Create subclasses `Dog` and `Cat` that override the `make_sound()` method.
- 3. Implement the sound generation logic for each subclass.
- 4. Test the program by creating instances of `Dog` and `Cat` and calling the `make_sound()` method.

6.Write a code for Restaurant Management System Using OOPS:

- Create a MenuItem class that has attributes such as name, description, price, and category.
- Implement methods to add a new menu item, update menu item information, and remove a menu item from the menu.
- Use encapsulation to hide the menu item's unique identification number.
- Inherit from the MenuItem class to create a FoodItem class and a BeverageItem class, each with their own specific attributes and methods.

7.Write a code for Hotel Management System using OOPS :

- Create a Room class that has attributes such as room number, room type, rate, and availability (private).
- Implement methods to book a room, check in a guest, and check out a guest.
- Use encapsulation to hide the room's unique identification number.
- Inherit from the Room class to create a SuiteRoom class and a StandardRoom class, each with their own specific attributes and methods.

8.Write a code for Fitness Club Management System using OOPS:

- Create a Member class that has attributes such as name, age, membership type, and membership status (private).
- Implement methods to register a new member, renew a membership, and cancel a membership.
- Use encapsulation to hide the member's unique identification number.
- Inherit from the Member class to create a FamilyMember class and an IndividualMember class, each with their own specific attributes and methods.
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9.Write a code for Event Management System using OOPS:

- Create an Event class that has attributes such as name, date, time, location, and list of attendees (private).
- Implement methods to create a new event, add or remove attendees, and get the total number of attendees.
- Use encapsulation to hide the event's unique identification number.
- Inherit from the Event class to create a PrivateEvent class and a PublicEvent class, each with their own specific attributes and methods.

10.Write a code for Airline Reservation System using OOPS:

- Create a Flight class that has attributes such as flight number, departure and arrival airports, departure and arrival times, and available seats (private).
- Implement methods to book a seat, cancel a reservation, and get the remaining available seats.
- Use encapsulation to hide the flight's unique identification number.
- Inherit from the Flight class to create a DomesticFlight class and an InternationalFlight class, each with their own specific attributes and methods.

11. Define a Python module named constants.py containing constants like pi and the speed of light.

12. Write a Python module named calculator.py containing functions for addition, subtraction, multiplication, and division.

13. Implement a Python package structure for a project named ecommerce, containing modules for product management and order processing.

14. Implement a Python module named string_utils.py containing functions for string manipulation, such as reversing and capitalizing strings.

15. Write a Python module named file_operations.py with functions for reading, writing, and appending data to a file.

16. Write a Python program to create a text file named "employees.txt" and write the details of employees, including their name, age, and salary, into the file.

17. Develop a Python script that opens an existing text file named "inventory.txt" in read mode and displays the contents of the file line by line.

18. Create a Python script that reads a text file named "expenses.txt" and calculates the total amount spent on various expenses listed in the file.

19. Create a Python program that reads a text file named "paragraph.txt" and counts the occurrences of each word in the paragraph, displaying the results in alphabetical order.

20. What do you mean by Measure of Central Tendency and Measures of Dispersion .How it can be calculated.

21. What do you mean by skewness.Explain its types.Use graph to show.

22. Explain PROBABILITY MASS FUNCTION (PMF) and PROBABILITY DENSITY FUNCTION (PDF). and what is the difference between them?

23. What is correlation. Explain its type in details.what are the methods of determining correlation

24. Calculate coefficient of correlation between the marks obtained by 10 students in Accountancy and statistics:

Student	1	2	3	4	5	6	7	8	9	10
Accountancy	45	70	65	30	90	40	50	75	85	60
Statistics	35	90	70	40	95	40	60	80	80	50

Use Karl Pearson's Coefficient of Correlation Method to find it.

25. Discuss the 4 differences between correlation and regression.
26. Find the most likely price at Delhi corresponding to the price of Rs. 70 at Agra from the following data: Coefficient of correlation between the prices of the two places +0.8.

27. In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible: Variance of x = 9, Regression equations are: (i) 8x-10y = -66; (ii) 40x - 18y = 214. What are (a) the mean values of x and y, (b) the coefficient of correlation between x and y, (c) the σ of y.

28. What is Normal Distribution? What are the four Assumptions of Normal Distribution? Explain in detail.

29.Write all the characteristics or Properties of the Normal Distribution Curve.

30.Which of the following options are correct about Normal Distribution Curve.

(a) Within a range 0.6745 of σ on both sides the middle 50% of the observations occur i,e. mean ±0.6745σ covers 50% area 25% on each side.
(b) Mean ±1S.D. (i,e.μ ± 1σ) covers 68.268% area, 34.134 % area lies on either side of the mean.
(c) Mean ±2S.D. (i,e. μ ± 2σ) covers 95.45% area, 47.725% area lies on either side of the mean.
(d) Mean ±3 S.D. (i,e. μ ±3σ) covers 99.73% area, 49.856% area lies on the either side of the mean.
(e) Only 0.27% area is outside the range μ ±3σ.

31. The mean of a distribution is 60 with a standard deviation of 10. Assuming that the distribution is normal, what percentage of items be (i) between 60 and 72, (ii) between 50 and 60, (iii) beyond 72 and (iv) between 70 and 80?

32. 15000 students sat for an examination. The mean marks was 49 and the distribution of marks had a standard deviation of 6. Assuming that the marks were normally distributed what proportion of students scored (a) more than 55 marks, (b) more than 70 marks

33. If the height of 500 students are normally distributed with mean 65 inch and standard deviation 5 inch. How many students have height : a) greater than 70 inch. b) between 60 and 70 inch.

34. What is the statistical hypothesis? Explain the errors in hypothesis testing.b)Explain the Sample. What are Large Samples & Small Samples?

35.A random sample of size 25 from a population gives the sample standard derivation to be 9.0. Test the hypothesis that the population standard derivation is 10.5.
Hint(Use chi-square distribution).

37.100 students of a PW IOI obtained the following grades in Data Science paper :
Grade :[A, B, C, D, E]
Total Frequency :[15, 17, 30, 22, 16, 100]
Using the χ 2 test , examine the hypothesis that the distribution of grades is uniform.

38.Anova Test:

To study the performance of three detergents and three different water temperatures the following whiteness readings were obtained with specially designed equipment.

Water temp	Detergents A	Detergents B	Detergents C
Cold Water	57	55	67
Worm Water	49	52	68
Hot Water	54	46	58

39.How would you create a basic Flask route that displays "Hello, World!" on the homepage?

40.Explain how to set up a Flask application to handle form submissions using POST requests.

41.Write a Flask route that accepts a parameter in the URL and displays it on the page.

42.How can you implement user authentication in a Flask application?

43.Describe the process of connecting a Flask app to a SQLite database using SQLAlchemy.

44.How would you create a RESTful API endpoint in Flask that returns JSON data?

45.Explain how to use Flask-WTF to create and validate forms in a Flask application.

46.How can you implement file uploads in a Flask application?

47.Describe the steps to create a Flask blueprint and why you might use one.

48.How would you deploy a Flask application to a production server using Gunicorn and Nginx?

49. Make a fully functional web application using flask, Mangodb. Signup,Signin page.And after successfully login .Say hello Geeks message at webpage.

50.Machine Learning:

- What is the difference between Series & Dataframes .
- Create a database name Travel_Planner in mysql ,and create a table name bookings in that which having attributes (user_id INT, flight_id INT,hotel_id INT, activity_id INT,booking_date DATE) .fill with some dummy value .Now you have to read the content of this table using pandas as dataframe.Show the output.
- Difference between loc and iloc.
- What is the difference between supervised and unsupervised learning?
- Explain the bias-variance tradeoff.
- What are precision and recall? How are they different from accuracy?
- What is overfitting and how can it be prevented?

- Explain the concept of cross-validation.
- What is the difference between a classification and a regression problem?
- Explain the concept of ensemble learning.
- What is gradient descent and how does it work?
- Describe the difference between batch gradient descent and stochastic gradient descent.
- What is the curse of dimensionality in machine learning?
- Explain the difference between L1 and L2 regularization.
- What is a confusion matrix and how is it used?
- Define AUC-ROC curve.
- Explain the k-nearest neighbors algorithm.
- Explain the basic concept of a Support Vector Machine (SVM).
- How does the kernel trick work in SVM?
- What are the different types of kernels used in SVM and when would you use each?
- What is the hyperplane in SVM and how is it determined?
- What are the pros and cons of using a Support Vector Machine (SVM)?
- Explain the difference between a hard margin and a soft margin SVM.
- Describe the process of constructing a decision tree.
- Describe the working principle of a decision tree.
- What is information gain and how is it used in decision trees?
- Explain Gini impurity and its role in decision trees.
- What are the advantages and disadvantages of decision trees?
- How do random forests improve upon decision trees?
- How does a random forest algorithm work?
- What is bootstrapping in the context of random forests?
- Explain the concept of feature importance in random forests.
- What are the key hyperparameters of a random forest and how do they affect the model?
- Describe the logistic regression model and its assumptions.
- How does logistic regression handle binary classification problems?
- What is the sigmoid function and how is it used in logistic regression?
- Explain the concept of the cost function in logistic regression.
- How can logistic regression be extended to handle multiclass classification?
- What is the difference between L1 and L2 regularization in logistic regression?
- What is XGBoost and how does it differ from other boosting algorithms?
- Explain the concept of boosting in the context of ensemble learning.
- How does XGBoost handle missing values?
- What are the key hyperparameters in XGBoost and how do they affect model performance?
- Describe the process of gradient boosting in XGBoost.
- What are the advantages and disadvantages of using XGBoost?

Machine learning Practical question:

1. Do the EDA on the given dataset: Lung cancer, and extract some useful information from this.

Dataset Description:
Lung cancer is one of the most prevalent and deadly forms of cancer worldwide, presenting significant challenges in early detection and effective treatment. To aid in the global effort to understand and combat this disease, we are excited to introduce our comprehensive Lung Cancer Dataset.

Link: Lung Cancer

2. Do the Eda on this Dataset :Presidential Election Polls 2024 Dataset and extract useful information from this:

Link: **Dataset: Nationwide Russian election poll data from March 04, 2024**

Dataset Description:
This dataset comprises the results of a nationwide presidential election poll conducted on March 4, 2024. The data offers various insights but does not align with the official election results. You are encouraged to create your notebooks and delve into the data for further exploration.

Assignment Submission Guidelines.

- **Please complete all theory questions in a Word document.**
- **For practical questions you can use any python notebook and push the code in github.**