

Maximum score: 100

KEY NOTES

THEORY QUESTIONS ASSIGNMENT

Software Stream

- This assignment to be completed at student's own pace and submitted before given deadline.
- There are 10 questions in total and each question is marked on a scale 1 to 10. The maximum possible grade for this assignment is 100 points.
- Students are welcome to use any online or written resources to answer these questions.
- The answers need to be explained clearly and illustrated with relevant examples where necessary. Your examples can include code snippets, diagrams or any other evidence-based representation of your answer.

Theory questions 10 point each

1. How does Object Oriented Programming differ from Process Oriented Programming?

Object orientated programming (OOP) can be defined by programs being made from objects. These objects are able to hold data that have unique attributes and behaviour. With OOP software engineers are able to manipulate, hide and modify data easily and quickly with efficient and precise code. When using OOP, developers must use data modelling, this is a process where a developer must identify all objects that will be used within the software and how they will relate to each other. When doing this, the developer will describe all attributes of the object (EG. If the object is a course, its properties will include subject, class size, teacher). From this the developer creates a class and is able to reuse this class to store data. OOP benefits from the use of inheritance where we are able to re-use data stored within the class and add or modify

this to suit a slightly different class/ object. Benefits of OOP include scalability, re-usability and efficiency.

Differently, Process Orientated Programming is defined by its use of processes and putting this at the forefront when creating software. Process orientated programming will rely heavily on the its functions that make up the software and can be called upon or executed at any point. When using Process orientated programming it may be harder to access data and therefore it may be harder to modify and add any changes to data that may have to be done when executing software. As there is no efficient way of holding/ storing data with Process Programming, this may make data less secure when compared to Object orientated programming. Functionality of the software and the code it is made of is paramount in process orientated programming. As this is data is not made priority ,different to OOP, Process orientated programming may be best suited for small to medium sized projects. .

2. What's polymorphism in OOP?

Polymorphism in programming allows us to substitute a particular name for an item so that it is easier to reuse. This allows us to use a single entity in a number of different functions and ways depending on our needs.

3. What's inheritance in OOP?

Polymorphism in OOP is the notion of the the same occurrence in different forms. One example of this could be the idea of a 'pet', within this a cat and dog and different in some attributes but will overall be very similar.

Polymorphism in programming will allow us to use similar attributes repeatedly without reusing or repeating code.

4. If you had to make a program that could vote for the top three funniest people in the office, how would you do that? How would you make it possible to vote on those people?

First I will create a programme that will ask the user to vote for who they believe is the funniest person, I will also give them a list of names that they are able to vote for. It will look something like this

input= “who is the funniest person in the office, chose from the following: Dwight, Michael, Pam, Phylis, Jim, Ryan, Angela, Kevin and Kelly”

Results from this question will first be stored in a list of names, this will then be converted into a dictionary using a Counter method. This will present the data with each persons name as a key and then the frequency of votes that have been counted as its value. Once this is completed we should the sorting function to process these votes/ values to find the order of who has the most accumulative votes.

Once this has been completed we will then be able to produce an output to return the three most voted for funny people in the office. We can decide how many places after first place we want to show by using this : `print (sorted_votes(1st [0], 2nd [1], 3rd [2]))`.

5. What's the software development cycle?

The software development cycle describes the life cycle of functioning software, from basic functions all the way to testing. Different project management systems will execute this cycle differently. The beginning of the software development cycle is planning and analysis. In these stages a team will work together to discuss what the product is and what the key features are, the analysis stage may go into more detail about who the product is for and how it will work effectively work for them.

Next is design, in this stage developers will work together with engineers in what the product will actually look like . The user interface and user experience is discussed here so developers are on the same page on what the product will be experienced like for users. Implementation is the actual execution of the design, this is where a Beta version of the product is produced for some users to test out.

Next stage is testing, this works seemingly with the implementation. Here testing engineers will spend their time ensuring that each part of functioning code for the product works effectively and does not break the code or create horrible error codes ruining tech user experience.

Maintenance is simply about keeping up the functionality of the software, this is necessary as operating systems and scalability changes over time. Maintenance is needed so that the software is able to adapt to changing needs.

6. **What's the difference between agile and waterfall?**

Agile and waterfall are distinctly different in their approach towards the software development cycle. With the waterfall approach, there is an ordinal method whereby the team cannot move to the next step unless the step they are on is complete. This can be time consuming as it could take long amounts of time to complete one step. Also within software it should be noted that teams may be back and forth with each other which could cause teams to go back to a step that they had already completed to adjust and modify.

An agile way of working is different due to its flexibility in approach. With Agile, teams are able to start multiple steps at once, this is an efficient way of working as teams are more malleable as their items/ tasks are not completely finished there is more space for tweaking and modifying if a team responsible for a different step has differing suggestions.

7. **What is a reduced function used for?**

Reduced function is used to be applied to all of its list elements and is used in combination with its argument, the reduce () can be found in the functors module. When using reduce (), it takes two elements of a sequence to process a result, the result is stored and the process continues throughout the array of data until there are no more elements in its container to process. The final result can be printed in your console. As mentioned the reduce function can be used in combination of other functions such as operator functions, by doing this reduce() can be used to calculate the total sum of a sequence of elements, when doing this the function will store the its result and return the summation value.

8. **How does merge sort work**

Merge sort is known as a divide and conquer algorithm that organises an array of data into equal halves and organised. Merge Sort will continue to split data into smaller manageable pieces so that is it easy to organise, it will do this until there is no more data to divide, we can think of this as a recursive algorithm. This type of recursion will equally split the data into halves until there is nothing left to divide. Once this sorting has completed, the algorithm will then merge the organised data. This operation will begin to process the smaller arrays of data and combine them to create a larger singular array.

9. **Generators - Generator functions allow you to declare a function that behaves like an iterator, i.e. it can be used in a for loop. What is the use case?**

Iterators do not store whole list of things (takes up lots of RAM) but has the object representing a stream of data (an iterable) so that it can be programmed and queried.

Generators are iterators but are considered to be a more elegant and effective way of coding. Using generators will allow us to iterate over a returned object in a loop. The use case of a generator is that we are able to loop through large amounts of data without needing to store it onto our storage systems. Generators are used when data that is used before or after a function does not need to be stored- generators are only interested in the product yielded after an iteration. As mentioned, the use of generators are particularly useful when using huge data sets which will take up a large amount of memory during processing or cleaning of this data.

10. Decorators - A page for useful (or potentially abusive?) decorator ideas. What is the return type of the decorator?

One example of a good decorator is one that can measure the amount of time taken to execute the inside function. This decorator is called `timeit` and can be used like so:

Import `timeit`

```
start= timeit.default_time()
```

```
somefunctions()
```

```
stop=timeit.default_timer()
```

```
Print ('Time:' ,stop-start)
```

This decorator is helpful when looking at time space complexity and how efficient a piece of code may be when executed, especially if this code is sorting data.

Another type of decorator can be used to add something before a message, an example of this is a welcome message to a user when they log onto a site. See below:

```
Def decorate_message(fun):
```

```
    def user_name (site_name):
```

```
        return "Hi {user}, welcome to" + fun (site_name)
```

```
    return user_name
```

```
@decorate_message
```

```
Def site(site_name):
```

```
    return site_name;
```

```
Print site("Code First Girls")
```

This will print Hi {user name} , welcome to code first girls". This is very helpful is we would like to elevate the functionality of some code. This also adds to the user experience making it more interactive and engaging.