SOFTWARE DEVELOPMENT

Units 3 & 4 – Written examination

*(*TSSM's *2014 trial exam updated for the current study design)*

SOLUTIONS

SECTION A: Multiple-choice questions (1 mark each)

Question 1

Answer: B

Explanation:
In a DFD an external entity is represented by a rectangle. Options A and C refer to symbols from a UCD, and option D (a process) is a circle.

Question 2

Answer: B

Explanation:
Key tasks associated with planning software projects include identifying, scheduling and monitoring tasks, resources, people and time. Options A and D refer to the analysis stage and option C refers to the design stage.

Question 3

Answer: C

Explanation:
This is straight from the Study Design, p16-18. Testing is a part of the development stage.

Question 4

Answer: D

Explanation:
Validation checks for the reasonableness of data being input into a system. Ensuring calculations work is a part of testing as is the output being accurate. Option C refers to evaluation.

Question 5

Answer: A

Explanation:
IF….END IF is a form of selection.

Question 6

Answer: C

Explanation:
A[] is a one dimensional array.

Question 7

Answer: C

Explanation:
The algorithm represents a selection sort.

Question 8

Answer: D

Explanation:
CrossCountry would be distributing client details without their consent and they are an organisation working with the Victorian Government so they would be in breach of the The Privacy and Data Protection Act 2014

Question 9

Answer: B

Explanation:
A binary search will only work on a sorted list. It doesn't only work with integers, however the list must contain items that are all of the same data type.

Question 10

Answer: C

Explanation:
500 save files per day x 2MB = 1000MB per day

1000MB x 365 days = 365,000MB

365,000/1,000 = 365GB

Question 11

Answer: A

Explanation:
Options C and D are incorrect, as they are both *searching* techniques, not *sorting*. A selection sort makes many swaps each pass becoming exponentially more inefficient the larger a list becomes. A quick sort is the most efficient technique for large lists.

Question 12

Answer: B

Explanation:
External entities cannot send data to or receive data from data stores. All of the other options for data flow are fine.

Question 13

Answer: D

Explanation:
This algorithm searches through an array sequentially, and is therefore a linear search. It doesn't keep track of enough variables to be a binary search, and doesn't perform any swaps so is not a sort.

Question 14

Answer: C

Explanation:
F[] has two indexes in the brackets, so can only be a 2D array. A 1D array only makes use of one index, and a random file can be accessed from any point so would not need a linear search algorithm. An integer is a data type so option B is incorrect.

Question 15

Answer: A

Explanation:
Information systems are a combination of digital systems, data, processes and people. It does not include information.

Question 16

Answer: C

Explanation:
The evaluation of an information system is used to check whether the information system has solved the original problem. Option A looks at validation which occurs during development for input data, option B refers to testing which also occurs during development. Option D relates to evaluating user documentation, not the solution itself.

Question 17

Answer: B

Explanation:
A worm is a form of self-replicating malware that has the effect of consuming bandwidth and slowing a network down.

Question 18

Answer: D

Explanation:
Data flows are used with DFD's, the *system boundary* is the rectangle around the UCD, *associations* are communication lines between actors and use cases and *actors* are the stick figures.

Question 19

Answer: A

Explanation:
Associations are always two way communication, whether they have an arrow or not. The arrow indicates which actor initiated the use case, and in this case the arrow comes from the patient.

Question 20

Answer: B

Explanation:
As John is sending the files via email, the only way to protect data during transmission is encryption. Although the other methods may help the security of the files within a LAN, they will not do anything during transmission.

Section B – Short answer

Question 1

a. Internal documentation is not read by a compiler so does not make a program run any less efficiently.
Internal documentation can assist when stepping through code and debugging so may even assist with developing a program more quickly.

2 marks

b. A common naming convention is Hungarian notation. Hungarian notation states that the name of an element must begin with a three letter prefix, for example a button might begin with "btn". The second part of the name needs to be meaningful to the purpose, for example if there is a button that is used to calculate an equation then it may be called "btnCalculate".

4 marks

Question 2

a. A record

1 mark

b. A record groups together variables for a particular purpose, in this case it is a single user's details. Records hold data for a single entity; however can contain multiple data types. An array is another data structure that also groups variables together under the same name and these are accessed via an index. However, an array can only hold items of the same data type.

2 marks

Question 3

An associative array is an abstract data type composed of a collection of pairs, such that each possible key appears just once in the collection. A common example of an associative array is a library system, where the pair includes the book and the borrower who has it currently checked out.

Associative arrays have a number of operations such as add, reassign, remove or lookup.

3 marks

Question 4

a.

```
FUNCTION find(nameToFind)
      found ← FALSE
      i ← 0
      DO
            IF members(i) = nameToFind THEN
                  found ← TRUE
            END IF
            i ← i + 1
      WHILE found = TRUE OR EOF
END
```

6 marks

b. A function is a segment of code that can be called from within a program and is used to break up code. They are often used when code needs to be used frequently and can accept parameters (in the example is was `nameToFind`) and a function will always return a value.
A procedure is very similar to a function and is also used within structured programming and can be called from within a program, however the main difference is that a procedure will not return a value.

2 marks

Section C – Case Study

Question 1

User expertise – The case study states that the brothers do not have much experience with computers, which will mean that the solution must be easy to use and not contain too much technical jargon.

Cost – Although not specifically mentioned, as a small business cost would be a major factor. This may impact on how much functionality they can afford to put into the solution.

4 marks

Question 2

Non-functional requirement: Robustness

Explanation: This relates to how well the solution will respond to poor use or input. As the users don't all have high level computer skills, the validation will have to be good to ensure that the solution still works even when unexpected input is encountered.

Non-functional requirement: User-friendliness

Explanation: The solution will need to be clear, intuitive and logical for the mechanics to be able to easily interact with it. This is important due to the mechanics skill levels with computers.

6 marks

Question 3

a. Although the parts themselves are required by the mechanics to fix the car, they are a physical object. Physical objects do not appear on a context diagram, only data flows.

2 marks

b. UCDs are often used as well as context diagrams as they represent different things. Whilst the context diagram represents data flowing to and from external entities and the system, a UCD will represent the interactions a role has with the system and the functionality that they will be using. To fully understand not only the logical data flow through a system but how the users interact with it, both diagrams are needed.

3 marks

c. In a context diagram, the arrow indicates the direction of data flow. It is also labelled with the data that is flowing from one place to another. In a UCD, the line represents an association between a role and a particular use case. In a UCD, communication is always assumed to be two way, whereas in a context diagram data only flows one way.

2 marks

Question 4

One data collection method would be to interview the three brothers. This would give IT2You a thorough understanding of what functionality each brother would like to see included in the system, and also allow for them to expand on their thoughts and follow up questions can be asked where required.

Another data collection method would be to observe the mechanics using the current system. This would give IT2You a look at how the mechanics use the current system and where any inefficiencies are that may need to be addressed.

4 marks

Question 5

A data dictionary lists all of the variables in a table that are being used in a program. It includes elements such as the variable name, its data type, its size, scope and a brief description of what it will be used for.

This will assist IT2You when developing the solution as they will already have an understanding of the variables required and their data type so the process will run more efficiently. It may also help them to track the variables later during debugging or future maintenance of the solution.

2 marks

Question 6

a. Russell, Glen and Barry should consider the storage capacity of each device. If data is being stored locally then they will need sufficient storage capacity to store job details while they work on each car. This would also affect their decision on which device to buy.

2 marks

b. An advantage of device 1 is that it has a stylus to input data, however a disadvantage is that it is slightly heavy, at 750 grams.
An advantage of device 2 is that it has 3G capability, however its memory is only 1GB which is the lowest of the devices.
An advantage of device 3 is that it has a QWERTY keyboard which the users would be familiar with, however it only has a battery life of four hours which would only last about half a day.
For their purposes, device 1 would be the most appropriate. Although a bit heavy, it has sufficient RAM and processor power but it also has the longest battery life (10 hours) and would last an entire day. A stylus would assist the mechanics to input data like they were writing it down and as there will be a wireless network running in the warehouse 3G capability is not required.

5 marks

c. In order to set up a wireless network within the warehouse they would require a wireless access point (WAP). A WAP would allow all of the tablet devices to connect to the network and send and receive data whilst being moved around from car to car.

2 marks

Question 7

a. Evaluation criteria are created during the design stage for a number of reasons. The first is that once you have completed analysis and design IT2You will have a thorough understanding of what the problems are with the current information system and therefore what the criteria should be to judge the success of the new system. It will also ensure the integrity of the development process as they will have to adhere to these criteria rather than just making up some after development that they know the system can accomplish.

2 marks

b. Effectiveness: Is the stock on hand when it is required?
Efficiency: Has the time taken to order stock decreased under the new system?

2 marks

Question 8

a.

Variable	Data type
`partRequired`	String
`partAvailable`	Boolean
`partNum`	Integer

b. The iteration sequence always executes until the end of the file, meaning that partNum is always going to correspond to the final part in the file. This can be fixed by changing line 11 to:

```
UNTIL End of File OR partFound = TRUE
```

Question 9

a.

paidDate	Expected totalCost	Actual totalCost	Reason for selecting test data
29/06/2014	500	500	This checks what will occur if the client has paid on time.
30/06/2014	500	500	This checks what will occur is the client pays right on the due date.
01/07/2014	502.5	2.5	This checks what will occur if the client pays late.
NULL	500	500	This checks what will occur if the client has not yet paid.

b. The mistake is at line 8 - `totalCost = daysOverdue * 0.005`. This has resulted in the customer who pays after the due date being charged the late fee rather than the original fee plus the late fee.

2 marks

c. Change line 8 to `totalCost = totalCost + (daysOverdue * 0.005)`

Question 10

One legislation that applies to this situation would be the Privacy and Data Collection Act 2014 This law states that an organisation that holds personal or sensitive data on a person (In this case it is their credit card details) they must take reasonable steps to ensure the security and integrity of that data,

3 marks

Question 11

a. One training method would be onsite training. As the mechanics do not have a high level of computer skills this would be appropriate as they can be fully trained by someone from IT2You in an environment where they are comfortable, they can ask questions where required and it is also the actual place where the solution will be in operation.

2 marks

b. A strategy for evaluating whether onsite training was effective would be to observe the mechanics who have been trained using the system, then manually calculate the bill and check this against the invoice that was produced by the mechanic that used the system to see if they have entered everything in correctly. They could then compare this to the mechanics that have not been trained in using the system.

2 marks