SOFTWARE DEVELOPMENT

Units 3 & 4 – Written examination

*(*TSSM's *2013 trial exam updated for the current study design)*

SOLUTIONS

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

Question 1

Answer: D

Explanation:
The problem-solving methodology consists of 4 stages – Analysis, Design, Development and Evaluation.

Question 2

Answer: C

Explanation:
An array stores multiple values of the same data type. A listbox is incorrect because a listbox is a control, a record groups together variables of varying data types and a variable is just a single value.

Question 3

Answer: B

Explanation:
Actors in UCDs refer to roles, as in any given situation more than one person/system may be performing that role. This is also why "a person" is incorrect. A process is shown as an oval, and data transmissions are best shown using a DFD.

Question 4

Answer: C

Explanation:
Authenticity is a characteristic of data that has integrity, not a factor that influences the design of solutions.

Question 5

Answer: B

Explanation:
Although a solution is only evaluated after it has been developed and implemented, the evaluation criteria is created in the design stage (this is straight from the Study Design).

Question 6

Answer: A

Explanation:
The algorithm is an example of a selection sort.

Question 7

Answer: A

Explanation:
It is a for… loop, which is an example of iteration.

Question 8

Answer: C

Explanation:
Macy has copied and distributed the e-book without the consent of the publisher, which makes her in direct violation of the Copyright Act 1968.

Question 9

Answer: D

Explanation:
A and B are incorrect, as they are both *sorting* techniques, not *searching*. For a binary search, the list must be sorted, so a linear search will be the only effective method.

Question 10

Answer: B

Explanation:
As ordering dessert is not always associated with the main use case of ordering the main meal, this means that it must be an <<*extend*>>. This rules out options A and C. With extends, the dotted line always points from the secondary use case back to the primary use case.

Question 11

Answer: B

Explanation:
The only error that can be shown in pseudocode is a logic error.

Question 12

Answer: C

Explanation:
Substituting the variable *grade* with 65, you will enter the selection statement. It is not greater than 80, nor is it greater than 65 (Note: There is no = sign), however it is greater than 50, so it will display 'pass'.

Question 13

Answer: C

Explanation:
The evaluation of an information system is conducted 3-6 months after implementation, once the users have gotten used to it.

Question 14

Answer: C

Explanation:
Push and Pop are operations of a Stack. Dequeue is an operation of a Queue. Tail is an operation of a linked list.

Question 15

Answer: A

Explanation:
Option A is an activity carried out while creating the Gantt chart. While Option B, C and D are carried out during the design and development phases. The Gantt chart with annotations along with logs is evaluated at a later stage.

Question 16

Answer: A

Explanation:
Data flows are used with DFD's, the *system boundary* is the rectangle around the UCD and *actors* are the stick figures. In a UCD, lines indicate associations.

Question 17

Answer: C

Explanation:
The <<*extends*>> is a conditional association that contributes to, or enhances the functionality of another use case.

Question 18

Answer: B

Explanation:
Spyware is a deliberate threat to the security and integrity of data.

Question 19

Answer: D

Explanation:
A Trojan is malware that is disguised as another file. The majority of malware on people's computers arrive as a Trojan, often from internet P2P applications.

Question 20

Answer: C

Explanation:
Archiving is different from backups. Backups usually have many copies so that access is not denied in case the data is lost, stolen or damaged. Archiving usually occurs when files are no more needed. Hence, archives are stored in medium to long-term storage and are usually compressed to preserve storage space.

SECTION B – Short answer

Question 1

a. A functional requirement is related to what the software solution is required to do. They relate to the inputs it will receive, the outputs it is required to produce and how it will behave. A functional requirement for the roll marking software may be to generate an attendance report for a given day.
A non-functional requirement is related to the characteristics of the software solution. In general, these can include user-friendliness, portability and maintainability. In relation to the roll marking software, an important non-functional requirement is reliability, as it needs to be working when staff have to mark the roll.

4 marks

b. Although the evaluation is done after the solution has been implemented, the evaluation criteria is written during the design phase using the requirements that have been set out in the SRS. This is because during the design phase Jimmy will know exactly how the success of the solution should be judged, as he will be designing what it should do.

2 marks

Question 2

a. An array

1 mark

b. Quick Sort – Quick sort is referred to a divide-and –conquer algorithm. Quick Sort partitions the items that need to be sorted into smaller and smaller sets and passes those sets back into itself. This process is called recursion.
Quick sort is faster than selection sort and hence is more efficient.
Note: Students may choose and explain either a selection sort OR a **quick sort**.

2 marks

Question 3

a. Monique may be in breach of the Privacy Act 1988. A law firm would store personal data about its clients, and one of the principles of the Act states that all personal information gathered from clients must be secured against unauthorised access, unauthorised use or disclosure. In an unsecured environment, she cannot guarantee the privacy of this personal information.

2 marks

b. To secure data during transmission it needs to be encrypted. Encryption will scramble data into ciphertext, which is unreadable. Only the intended recipient will be able to unscramble the data back into plaintext. Even if intercepted during transmission, the data will not be able to be read.

3 marks

Question 4

a. Does the new solution contain all necessary client details?

1 mark

b. Is it quicker to access details from the new system than it was in the past?

1 mark

c. **Interview** – Interview the managers about how the system has been running, and whether or not they think that it has been more effective and efficient than the old system. An interview would give them a lot of qualitative data and allow them to expand upon any issues that they may have been experiencing.
Survey – As there are up to 80 computers running at a time, it would be too time consuming to interview all employees (assuming that there are at least 80 of them!). Creating and distributing a survey would be a faster way to gather the thoughts of the people who interact with the system on a daily basis.

4 marks

SECTION C – Case Study

Question 1

a.

Variable	Test data	Expected value	Actual value
total_days	4	800	800
total_days	5	900	100
total_days	6	1080	120

Note: Test data that tests the boundaries is acceptable. Students may also have chosen one "nonsense" value to test the validation.

3 marks

b. The error is that instead of giving a 10% discount, the algorithm is multiplying the overall price by 10%.

1 mark

c. Line 10 currently reads: `cost ← cost * 0.1`. Change the 0.1 to 0.9 and instead of the total being 10% of the full price, it will return 90% of the full price (i.e. A 10% discount).

2 marks

Question 2

a. The positive to not including encryption is that they will save money, as they won't have to pay for the database hosted online by the ISP and it may be a bit quicker to set up as they don't have to get it programmed in. However, the negative is that the data will not be secure. Anyone could access, change and even delete bookings. I would strongly advise Captain Mack to include encryption, even if it means paying a bit more.

4 marks

b. Captain Mack may be breaking the Privacy Act 1988, specifically the privacy principle that all data must be kept secure from unauthorised access.

2 marks

c. Reason 1: Bookings made during the day may contradict each other
Explanation: There are currently two employees plus Captain Mack who can make bookings during the day on their mobile devices. They might all book charters at the same time with the same operator, and only find this out at the end of the day.
Reason 2: Data duplication and loss
Explanation: A similar version will be stored on all mobile devices. Captain Mack and all employees can make bookings throughout the day, and they may overwrite them at the end of the day, leading to overwriting bookings.

6 marks

Question 3

Criteria	Technique
Is the solution easy to use?	*Ask Captain Mack and his employees for feedback on the location of functions, navigation through the solution and their understanding on using the system.*
Are accurate results produced when data is entered?	*Get Captain Mack and the employees to record bookings and what the output from the database should be. Then check this against what the output from the database actually is.*

2 marks

Question 4

Three validation techniques that need to be performed on inputs are existence checks, data type checks and range checks. They need to be performed in this order, otherwise they will not work. This is because data needs to exist before performing a data type check, and you need to know the data type before you can perform a range check on it.

For a date, you first need to check that the user has entered it. Then you would need to check that it is in fact a date and finally that it falls within a particular range. For this, it may be that the start_date has to fall within the next 6 months and the end_date may have to fall within 2 weeks after the start_date.

4 marks

Question 5

Internal documentation is written in the program's code and describes key variables and procedures within a program. It can also explain any naming conventions used. It isn't read by a compiler and doesn't add any time to processing; however it will assist Andrew and any other future programmers in understanding the code, should they need to make.

2 marks

Question 6

Non-functional requirement: Response rates

Explanation: As clients will be ringing up for a quote, they will need to quote immediately. This is the whole point of creating a new system, so the response rate needs to be very fast. If it isn't, they may lose a potential client.

Non-functional requirement: Reliability

Explanation: *BookFish* needs to be accessed by the mobile devices throughout the day, and be working the entire time. This means that the mobile devices must be able to connect to the webserver at all times in order to create quotes and make bookings.

6 marks

Question 7

An information system is made up of digital systems (hardware, software and networks), data, processes and people.

2 marks

Question 8

Andrew has made use of radio buttons as you can only select one. Had he used check-boxes, multiple options could have been selected. As per the case study, clients can only select one type of fishing for a particular charter so he needed to use radio buttons.

2 marks

Question 9

Two constraints for using mobile devices for accessing *BookFish* might be the battery life, particularly if the employees are out of the office all day, and the screen size, as this may hinder the employees' ability to enter data.

2 marks

Question 10

Testing is ensuring that expected output matches the actual output. A testing table will include the item tested, a range of test data, the expected result, the actual result and any comments as required. If it is discovered that the expected output and actual output are not the same, then the code within the solution will need to be changed.

4 marks

Question 11

a. Selection sort

1 mark

b. An array

1 mark

c. Lines 8-10, the swap sequence does not work properly. It ends up with all three values the same.

2 marks

d. The swap should be changed to:

```
temp ← A[I]
A[I] ← A[subList]
A[subList] ← temp
```

2 marks

Question 12 – *Answers may vary*

Evaluating an organizational project plan entails answering the questions below.

1. Did the project finish on time?

2. Did the project finish on budget?

3. Were any tasks delayed in your project? Which ones were they? Why weren't they anticipated?

4. Did any assumptions go wrong? Which ones?

5. Did all tasks take the same amount of time as estimated in the Gantt chart?

6. Was the design and development team stretching to meet deadlines throughout the project?

7. When were the last requirements added to the project?

Question 13

a. The backup media that I would recommend is a cloud storage. Cloud storage is off site and hence will always be available if the copies onsite are lost, damaged or corrupted.

2 marks

b. A backup procedure that I would recommend is to complete a full backup at the end of every week, and an incremental backup at the end of every other day. This is because a full backup will copy all data to the backup media, however will be time consuming to do. An incremental backup will only consist of any changes made since the last incremental backup, which is quite fast. To restore from this, Captain Mack would only ever need to full backup plus any incremental backups done since, which is a worst-case scenario of 4 incremental backups.

4 marks