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YEAR 12 *Trial Exam Paper*

2018

COMPUTING: SOFTWARE DEVELOPMENT

Written examination

Sample responses

This book presents:

- high-level sample responses
- mark allocations
- tips on how to approach the exam.

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SECTION A – Multiple-choice questions

Question 1

Answer: B

Explanatory notes

The architecture described is peer-to-peer, where each computer has the same capabilities and responsibilities – sending and receiving files or portions of files. Rich clients are networked computers that have some resources stored locally and some that are stored on a network, such as those stored on a central server. Client-server architectures require a central server, and service-oriented architectures are single applications that run independently and can be accessed remotely.

Question 2

Answer: D

Explanatory notes

As stated in the Study Design, efficiency is a measure of how much time, cost and effort is applied to achieve intended results. Measures of an efficient solution could include the speed of processing, its functionality and the cost of file manipulation. Tests for accuracy (checking that the financial data is accurate, tracking the number of errors in the system over a three-month period) and usability (participating in usability testing and providing feedback) are effectiveness measures.

Question 3

Answer: D

Explanatory notes

Secure Sockets Layer (SSL) is the predecessor of Transport Layer Security (TLS), and as of June 2015 is prohibited for use by the IETF (Internet Engineering Task Force, the internet standards body) due to security vulnerabilities. TLS is used to provide cryptographic protocols that provide communications security over a computer network. HTTP Security Protocol does not exist as a security protocol; HTTPS refers to 'HTTP Secure'. Even so, HTTPS utilises TLS as its protocol. TCP/IP is an internet protocol suite that does not provide the security Maya needs. As Maya wants to use the most up-to-date security measure, she must use TLS.

Tip

- *Computing is a fast-changing field, and it is important that software developers keep up to date with changes in protocols and standards, particularly in relation to security.*

Question 4

Answer: A

Explanatory notes

Deciding how data will be named, structured, validated and manipulated occurs in the design stage of the problem-solving methodology. It typically occurs before any development begins, as it allows for consistency throughout the entire software solution. This is particularly important if there is more than one developer.

Question 5

Answer: B

Explanatory notes

Methods are functions or procedures within classes and objects. An instruction is a single line of code. Functions return values whereas procedures do not.

Question 6

Answer: A

Explanatory notes

A record typically has varied data types. Dictionaries and hash tables are both types of associative arrays consisting of (key, value) pairs instead of integer index values. Arrays contain multiple elements of the same data type. All three data structures in the pseudocode (`a`, `b` and `c`) contain multiple elements of the same data type.

Question 7

Answer: B

Explanatory notes

The `Alpha` algorithm is performing a sort, and the result, once complete, is a sorted list of all elements passed to it.

Question 8

Answer: C

Explanatory notes

Documenting functional requirements occurs as part of constructing an SRS in the analysis stage of the problem-solving methodology. It is also one of the more time-consuming components of the SRS.

Question 9

Answer: C

Explanatory notes

The task is a milestone as it has 0 days duration. This means that it is a key event in the project timeline, but does not take any 'time' within the project itself.

Question 10

Answer: A

Explanatory notes

Linear and binary are both searches, so do not apply here. As the data is already sorted, this is considered a 'best case' scenario in relation to algorithm complexity. Quick sort has a sort time complexity of O(n log n) in the best case. Selection sort has a sort time complexity of O(n^2) in the best case.

Question 11

Answer: C

Explanatory notes

As this is a clinic that provides health services to clients, the federal *Privacy Act 1988* is the most relevant. The clinic is based in South Australia, so the *Privacy and Data Protection Act 2014* and the *Charter of Human Rights and Responsibilities Act 2006* do not apply, as they only apply in Victoria.

Tip

- *It's important that you know where and when legislation applies, in particular with state-based legislation.*

Question 12

Answer: A

Explanatory notes

The most important information Charlie needs is what type of phone each agent is using, so that he can make sure the software will work on all of them. This can be achieved efficiently by asking all the agents via a questionnaire.

Tip

- *When considering data collection, it's important that you consider the needs and requirements of the situation. While it can be useful to perform observations and interviews, they are time consuming and not necessarily relevant when a survey or questionnaire can obtain the same information.*

Question 13

Answer: C

Explanatory notes

Data stores are represented as two parallel horizontal lines, data flows are arrows, processes are circles, and entities are rectangles. The direction of each data flow is important, as the arrowhead points to the element that 'receives' the data. In this instance, the client does not initiate any of the data flows – they only receive one containing an invoice as data.

Question 14

Answer: D

Explanatory notes

While the other variables are shorter, potentially making them more efficient to type, they are ambiguous as to the data being stored within them, which reduces clarity; 'T' is somewhat meaningless, and 'temp' is a frequently used shortening for 'temporary'. The lowercase letter 'l' is also easily misread as a number, reducing its effectiveness in terms of clarity.

Tip

- *It's important to note that efficiency in this case is not only a measurement of the time taken to type something – it can also be used to measure the time it takes to understand something, or to know what it does.*

Question 15

Answer: B

Explanatory notes

Element contents are when elements contain other elements. These are also referred to as sub-elements.

Question 16

Answer: B

Explanatory notes

An attribute describes or provides additional information about an XML element. In this document, it flags whether a message has been read or not.

Question 17

Answer: D

Explanatory notes

Organisational goals provide guidance and direction to companies. They assist in planning for the future and they support the evaluation process. Goals are therefore broad statements that can be difficult to measure. Organisational objectives are often quantifiable statements that expand on the goals of an organisation in a way that allows them to be assessed. They are generally measurable through data collection or manipulation.

Question 18

Answer: C

Explanatory notes

Characteristics of data that have integrity include accuracy, timeliness, reasonableness, authenticity and correctness.

Question 19

Answer: D

Explanatory notes

GPRS is a packet-based wireless communication service that allows continuous connection to the internet from mobile devices. It does not have the security that Selim is using to connect to work. A LAN is a local area network and would not allow Selim to connect to his work computer. PGP is a type of encryption software, not a method of connecting to networks. A VPN (virtual private network) allows secure connections to occur over non-secure connections, such as Selim's broadband internet connection at home.

Question 20

Answer: A

Explanatory notes

Event-based threats are out of the control of users. In this instance, the SSD has likely experienced a hardware failure.

SECTION B – Short-answer questions

Question 1

Sample response

accessibility

Mark allocation: 1 mark

- 1 mark for the correct effectiveness measurement

Question 2

Sample response

A trace table is a technique used to test algorithms (and computer programs) for logic errors that occur when the algorithm or program executes. It mimics the flow of execution of an algorithm and allows a user to 'step through' the algorithm and track how variables change as statements are executed. This also allows programmers to visualise how a program works.

Mark allocation: 2 marks

- 1 mark for stating that it allows for logic errors to be detected
- 1 mark for describing the process that must be undertaken when using a trace table (e.g. step through, tracking variables)

Question 3

Sample response

Any two factors that influence project plans can be discussed. Typical responses would include discussions of timing, such as overestimating or underestimating the time it takes to complete a component. Interacting with clients can also cause problems with scheduling, which can delay projects. You may also have had unexpected events occur that meant work could not be completed at the time initially planned.

Mark allocation: 4 marks

- 1 mark for each factor discussed (up to 2 marks)
- 1 mark for each specific example linked to the factor (up to 2 marks)

Tip

- *Be specific when answering any questions that ask about your experience with your SAT. You should avoid generic responses such as 'some elements took longer' and instead include specific examples as part of your discussion.*

Question 4

Sample response

```
Algorithm searchForCompetition
Begin
     Input competition    // the name of the competition to find
     Input allEntries     // an array of all lines from the file, as strings
                          // where the index value begins at 0

     counter ← 0
     While counter < length(allEntries) Do
          If allEntries[counter] = competition Then
               Print allEntries[counter+1]
               ExitWhileLoop
          EndIf
          counter = counter + 2
     EndWhile
End
```

Mark allocation: 3 marks

- 1 mark for using a loop to iterate through `allEntries` linearly
- 1 mark for checking for the competition being searched for
- 1 mark for correctly printing the wins and losses (using an offset of +1)

Question 5a.

Sample response

data mining

Mark allocation: 1 mark

- 1 mark for the correct response

Question 5b.

Sample response

Selection sort is a combination of searching and moving. An unsorted list is looped through and the element with the smallest value is moved to position 0. The process is continuously repeated, with each search working on the remaining unsorted list and each found element being moved to its position after the previously found smaller elements. When there are no more elements in the unsorted part of the list, the selection sort ends, as all the elements in the first part of the list are in order, sorted from smallest to largest.

Mark allocation: 3 marks

- 1 mark for discussing how each pass selects the smallest value of the unsorted part of the list
- 1 mark for discussing how the unsorted list size is reduced each time
- 1 mark for discussing when the sort is complete

Question 6

Sample response

Staff remotely using a personal laptop that has malware:

Risk: Malware is software specifically designed to disrupt, damage or gain access to a computer system. There is a risk that the financial records will be compromised if staff are using infected computer systems.

Steps: Rosemary could put in place training measures for staff to show them how to keep their antivirus software up to date. Most antivirus software is free or built into operating systems, so all staff should be able to use an antivirus scanner of some kind.

Staff accessing the financial system using public wi-fi hotspots:

Risk: Public wi-fi is not secure, as it requires no authentication to establish a network connection. Anyone using it ought to do so with the assumption that anything accessed via that network is visible to a third-party with access to that hotspot. There is a high risk of packet sniffing or data hijacking if staff are using the system on an unsecured network.

Steps: Rosemary should put in place a VPN (virtual private network) for staff to use before they can access the financial system remotely. A VPN creates a secure encrypted connection that protects the network and the data transmitted and stored on it. This would protect the data even if staff used public wi-fi to connect to that VPN.

Mark allocation: 6 marks

- 1 mark for each explanation of a risk (up to 2 marks)
- 2 marks for each description of the steps that Rosemary can take – this should involve a description rather than just a statement (up to 4 marks)

Note: Only 1 mark will be awarded for a description if only a suggestion such as ‘have staff use a VPN’ is given.

SECTION C – Case study

Question 1

Sample response

Any two of:

- receive voice recording
- activate Kodo
- play output.

Mark allocation: 2 marks

- 1 mark each for a correct functional requirement (up to 2 marks)

Tip

- *When a question asks you about functional requirements, the case study will always provide you with the information you need. If there are no diagrams, such as data flow diagrams or context diagrams, you will need to read the written text carefully to find the information you need. Sometimes you can use diagrams from other questions to help guide your choices.*

Question 2

Sample response

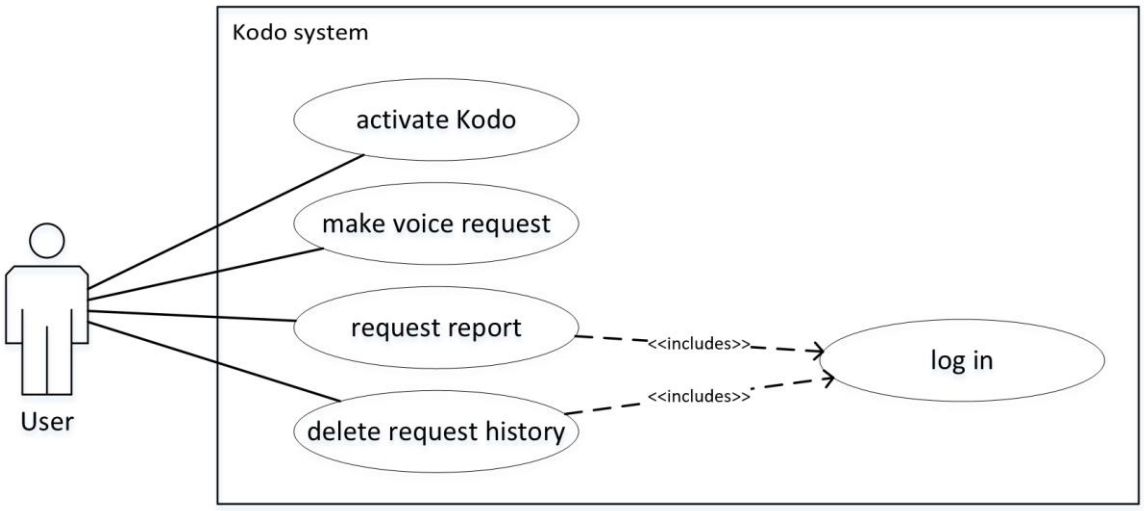
The receivers have a technical constraint of range due to the Bluetooth connection to the main unit.

Mark allocation: 2 marks

- 1 mark for stating that the constraint is technical
- 1 mark for explanation relating to range and Bluetooth connection to the main unit

Question 3

Sample response



Mark allocation: 5 marks

- 1 mark for showing the system boundary
- 1 mark for correct actor
- 2 marks for correct main use cases (minor errors/mostly correct can receive 1 mark)
- 1 mark for use of <<includes>> for log in (both instances required)

Tip

- *It's important that you understand what <<includes>> and <<extends>> mean in use case diagrams. As use case diagrams do not show sequence, the <<includes>> association can be very helpful in showing that a particular process must occur within another process. In this case, it shows that users must log in to view reports or delete request histories. This is much clearer than having 'log in' associated directly to the user.*

Question 4

Sample response

A Record voice request

B Analyse request

C Specialised online search database

D Analysed text

E Voice recording to be deleted

Mark allocation: 5 marks

- 1 mark for each correct label (up to 5 marks)

Tip

- *Make sure you use appropriate wording for your processes and data flows. Data flows should always be noun phrases and processes should always be verb phrases.*

Question 5a.

Sample response

The receivers use Class 2 Bluetooth to connect to the main unit. As Class 2 Bluetooth has a range of approximately ten metres, and the area to be covered is 20 m × 20 m, Satoshi needs to install four receivers at a minimum.

Mark allocation: 2 marks

- 1 mark for stating that four receivers are needed
- 1 mark for an explanation linking to Bluetooth range and size of the area to be covered

Tip

- *It's important to know the maximum ranges of transmission devices. Bluetooth has three classes, each with different ranges. Class 1 Bluetooth transmits up to 100 metres, Class 2 up to ten metres, and Class 3 less than ten metres (typically less than one metre).*

Question 5b.

Sample response

Satoshi currently has locks on doors and latches on windows but he can increase physical security by installing a motion-activated alarm system.

Mark allocation: 1 mark

- 1 mark for providing a reasonable suggestion for increasing security

Note: There are many valid responses to this question, involving either physical controls or software controls: Satoshi could lock the system in a safe when he is not at home; he could add additional encryption to the Kodo system so that if it is stolen the software cannot be accessed; he could incorporate a 'kill switch' activation where if it is stolen he can remotely wipe the system etc.

Question 6

Sample response

As Kodora is contracted to work for the Australian government, they must comply with the *Privacy Act 1988*. They are also a Victorian company, and thus must comply with the *Privacy and Data Protection Act 2014* and the *Charter of Human Rights and Human Responsibilities Act 2006*. By creating a hidden feature that can be activated by anyone, there is a risk that the privacy of an individual could be violated, as they are being recorded without their knowledge. This would contravene all three pieces of legislation.

Mark allocation: 4 marks

- 1 mark for referring to each of the three pieces of relevant legislation (up to 3 marks)
- 1 mark for explaining the context in relation to privacy

Question 7a.

Sample response

The error is contained in the while loop statement:

```
While nextLine = "EndOfFile" Do
```

This line of code means that the instructions in the while loop will only be executed if it has reached the end of `analysedRequest` – meaning that unless the analysed request returns an empty result, it will never execute at all.

Mark allocation: 2 marks

- 1 mark for stating that the while loop contains an error
- 1 mark for explaining that the while loop will not execute unless the analysed request is empty

Question 7b.

Sample response

The equals sign needs to be changed to a not-equal sign:

```
While nextLine != "EndOfFile" Do
```

Mark allocation: 2 marks

- 1 mark for stating that the equals sign needs to be changed
- 1 mark for rewriting the code to change the equals sign

Tip

- *Pseudocode does not have a single convention for writing 'not equal to'. Many ways would be accepted. For example, both '<>' and '!=' are accepted methods of indicating 'not equal to'. You can also use 'not equal to' as full words.*

Question 8

Sample response

Variable name	Data type or structure	Explanation
frequency_used	integer	how often Kodo was used (per day) in the given time period
receiver_mostused	string	the name of the receiver that was used most often in the given time period
time_period	integer	total days to be used when calculating statistics
all_requests	array	all of the saved requests in the given time period

Mark allocation: 4 marks

- 1 mark for each correct data type or structure (up to 4 marks)

Question 9a.

Sample response

Test no.	Password	Reason	Expected return result
1	B3tOnBTC!	all password requirements are met	True
2	Satosh!	passes uppercase and punctuation test but fails the length test	False
3	satoshi!	passes the length and punctuation test but fails the uppercase and number test	False
4	s4tosh!	fails the uppercase test, but passes the number test. Passes the punctuation test but fails the length test	False
5	Satoshii	passes the length, uppercase/number test but fails the punctuation test	False

(There are many possible passwords that could be used appropriately with the tests given.)

Mark allocation: 8 marks

- 1 mark for each correct password for testing purposes (up to 4 marks)
- 1 mark for each correct expected return result, based on the reason given (up to 4 marks)

Note: You cannot be awarded more than 1 mark per condition tested (i.e. repeating the same test).

Question 9b.

Sample response

type checking

Mark allocation: 1 mark

- 1 mark for stating the correct validation technique

Question 9c.

Sample response

The use of if-statements is not efficient, as each condition is being checked even if the password has failed an earlier condition. Nested if-statements will improve the algorithm, as using else-statements means that each condition is only checked if it has passed a prior condition.

Mark allocation: 2 marks

- 1 mark for explaining why the algorithm is inefficient
- 1 mark for the suggestion of nesting the if-statements to improve it

Question 10

Sample response

Data mining is the process of using machine learning, statistics and artificial intelligence on large amounts of data in order to detect patterns and relationships. Satoshi could use data mining to improve the accuracy of the search requests so that relevant data is returned more frequently.

Mark allocation: 2 marks

- 1 mark for defining data mining
- 1 mark for describing how Satoshi might use data mining to improve the database

Question 11

Sample response

The three factors that are most relevant are usability, security and marketability. Serai wants to release the system in multiple countries, not all of which are English-speaking. This means that the system should be easy to use. She also wants it to be marketable, both in relation to supporting multilingual voice recordings, but also in making it easy to install; people are less likely to buy something that needs expensive installation. Security will influence the design of the solution as she wants the reporting system to be securely accessed.

Mark allocation: 6 marks

- 1 mark for each correct design influence (up to 3 marks)
- 1 mark for each relevant explanation in relation to the case study (up to 3 marks)

Question 12

Sample response

The goal of usability testing is to identify any usability problems by collecting qualitative and quantitative data and determining user satisfaction with the software system. In this instance, a selection of representative users (any volunteer) could be observed completing tasks on the new system: setting it up, using it and accessing the summary reports. They would be observed while doing the tasks in order to detect any problems that they have using the system. After completing the tasks, they could fill in a survey asking about their overall satisfaction with the product. The survey results would then be analysed in conjunction with the observation data to determine if any changes need to be made to Kodo.

Mark allocation: 4 marks

- 1 mark for explaining the goal of usability testing
- 1 mark for discussing the type of user who will complete the testing
- 1 mark for explaining that users will complete tasks and be observed as part of testing
- 1 mark for explaining at least one form of documentation, such as a user survey or recording of observation notes

Tip

- *Always look to see how many marks the question is worth. This question requires a lengthy description of the technique that could be used for usability testing, with a full explanation of what is involved at each step.*

Question 13

Sample response

Satoshi could write an auto-delete mechanism that, if the internal storage is near capacity, deletes a certain number of old requests. This would allow the Kodo system to still maintain as many old records as possible, as only the minimum amount is deleted.

Mark allocation: 2 marks

- 1 mark for an appropriate modification
- 1 mark for a valid reason (such as referring to keeping as many old records as possible)

Question 14

Sample response

Archiving is moving files that are no longer used to another location, whereas disposal is deleting those files entirely.

Mark allocation: 2 marks

- 1 mark for defining both archiving and disposal
- 1 mark for comparing the two actions

Tip

- *When a question asks you to compare two items, make sure that you use comparison linking adverbs or conjunctions, such as 'whereas' or 'however'. This ensures that you are not simply providing two definitions.*

Question 15a.

Sample response

Possible answers are listed below.

Accuracy: Depending on how the data is transferred, a risk to accuracy is that the data is corrupted in transit.

Timeliness: The other company's search database may not be very efficient, resulting in slowing the entire system. This may result in the reduction of timeliness in delivering processed requests back to a user.

Reasonableness: Extra checks will need to be put in place within the Kodo system to make sure the data received back from the external company matches the expected range or type of data that the system needs.

Authenticity: Authentic data must come from a trusted source. Serai would need to do some more research on the other company to make sure their data is going to be useful for Kodo.

Correctness: The quality of the data from the other company may be poor; the results may not necessarily be correct based on the text being searched.

Mark allocation: 2 marks

- 1 mark each for stating any one of: accuracy, timeliness, reasonableness, authenticity, correctness
- 1 mark each for a valid explanation

Question 15b.

Sample response

One advantage of XML as a file format is that it reduces the risk of data becoming corrupt on transfer (as it is plain text). This reduces the risk to accuracy. Another advantage is the readability of XML for humans, allowing the correctness of sample searches to be manually verified.

There are numerous correct responses, including:

- Not a lot of processing needs to occur with XML to be able to search it, so it can reduce the risk of problems with timeliness.
- XML includes the ability to validate the data received, reducing the risk to reasonableness of the data.

Mark allocation: 2 marks

- 1 mark for each appropriate advantage relevant to the case study (up to 2 marks)

END OF SAMPLE RESPONSES