Rewarding Learning

ADVANCED
General Certificate of Education
2023

Software Systems Development

Unit A2 1:

Systems Approaches and Database Concepts

[ADV11]

THURSDAY 1 JUNE, AFTERNOON

MARK SCHEME

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

Fact finding techniques

AVAILABLE MARKS

1 (a) Examples:

As a shop manager
I want low level stock alerts/stock control system
So that I don't run out of stock/items can be reordered on time

As a shop manager
I want to flag order discrepancies automatically
So that I can ensure orders are correctly received

As the business owner
I want to be able to adjust item costs internally
So that I have precise knowledge of stock value

[1] for each relevant answer for 'I want'
[1] for each relevant reason for 'so that' [4]

(b) What other techniques could be used to gather the information? Use specific examples from the gift shop at Thompsons.

Technique	**Required information**
Observation/shadowing	How the stock-taking process on Monday 19th September 2022 was conducted and what was recorded.
Interview	How Nursery stock requirements are gathered.
Document Inspection (Do not accept 'paper trail')	The exact detail recorded on order forms for Tuesday 13th September 2022.
Questionnaire/Survey	What customers think of the service in the gift shop.

[1] for technique [4] 8

Methodologies – missing words/phrases

AVAILABLE MARKS

2 **Agile** methodologies are performed in an **iterative/incremental** and **incremental/iterative** manner. There is significant emphasis on the role of the **user** in the development of a system.

Examples of this type of methodology include **SCRUM**, **DSDM** and **XP**. (Any order)

These methods promote **working software** over **documentation**.

In **Agile** methods, entire features are developed within each **iteration**. **Testing** occurs throughout the development process.

Traditional approaches to system development are **sequential/rigid** and **rigid/sequential** in terms of how the process flows. There is limited **user** involvement. **Testing** is performed at the end of the lifecycle. Usually, **working software** is delivered late in the life cycle.

[1] for each two correct answers [9] 9

3 Evaluate the usefulness of evolutionary and throwaway prototyping, providing specific examples of how each could be applied at Thompsons.

AVAILABLE MARKS

Answers may include:

Prototyping is used to help visualise how a system or parts of a system are likely to function before a final solution is implemented. It can result in a system being more complete and satisfactory to the user.

Evolutionary prototyping produces a basic model for the user. This is refined until the model is acceptable to the user and evolves into the final system.

The process is iterative until a successful outcome is achieved. However, this could result in a product that is not tightly specified and could lead to errors and the need for corrective action.

Throwaway prototyping again starts with a basic model which the user will consider for accuracy. This model will not have all of the functionality of the final product The developers will then proceed to develop the final product and the prototype will be 'thrown away'.

Example of application at Thompsons:

A dummy interface for the online ordering system may be created without functionality. This could be shown to Harry and some of his staff for feedback on the aesthetic, e.g. proposed menus, button placement, user options, colour scheme. Feedback could help determine the user requirements and the prototype could be discarded at this point (throwaway), or refined to include the requested changes (evolutionary).

Level 1 ([1]–[2])
Overall impression: Basic
Candidate provides a basic answer demonstrating limited knowledge and understanding of prototyping.
Candidate provides a basic explanation of how throwaway or evolutionary prototyping could be applied to Thompsons.
Candidate makes only a limited selection and use of an appropriate form and style of writing.
The organisation of the material may lack clarity and coherence.
There is little use of specialist vocabulary.
Presentation, spelling, punctuation and grammar may be such that the intended meaning is not clear.

Level 2 ([3]–[4])
Overall impression: Good
Candidate provides a good answer demonstrating good knowledge and understanding of prototyping.
Candidate provides a good explanation of how throwaway or evolutionary prototyping could be applied to Thompsons.
Candidate makes good selection and use of an appropriate form and style of writing.
Relevant material is organised with some clarity and coherence.
There is good use of specialist vocabulary.
Presentation, spelling, punctuation and grammar are used appropriately so the intended meaning is clear.

Level 3 ([5]–[6])
Overall impression: Excellent
Candidate provides an excellent answer demonstrating excellent knowledge and understanding of prototyping.
Candidate provides an excellent explanation of how throwaway or evolutionary prototyping could be applied to Thompsons.
Candidate makes excellent selection and use of an appropriate form and style of writing.
Relevant material is organised with a high degree clarity and coherence.
There is excellent use of specialist vocabulary.
Presentation, spelling, punctuation and grammar are used to a high standard so the intended meaning is clear. [6]

AVAILABLE MARKS

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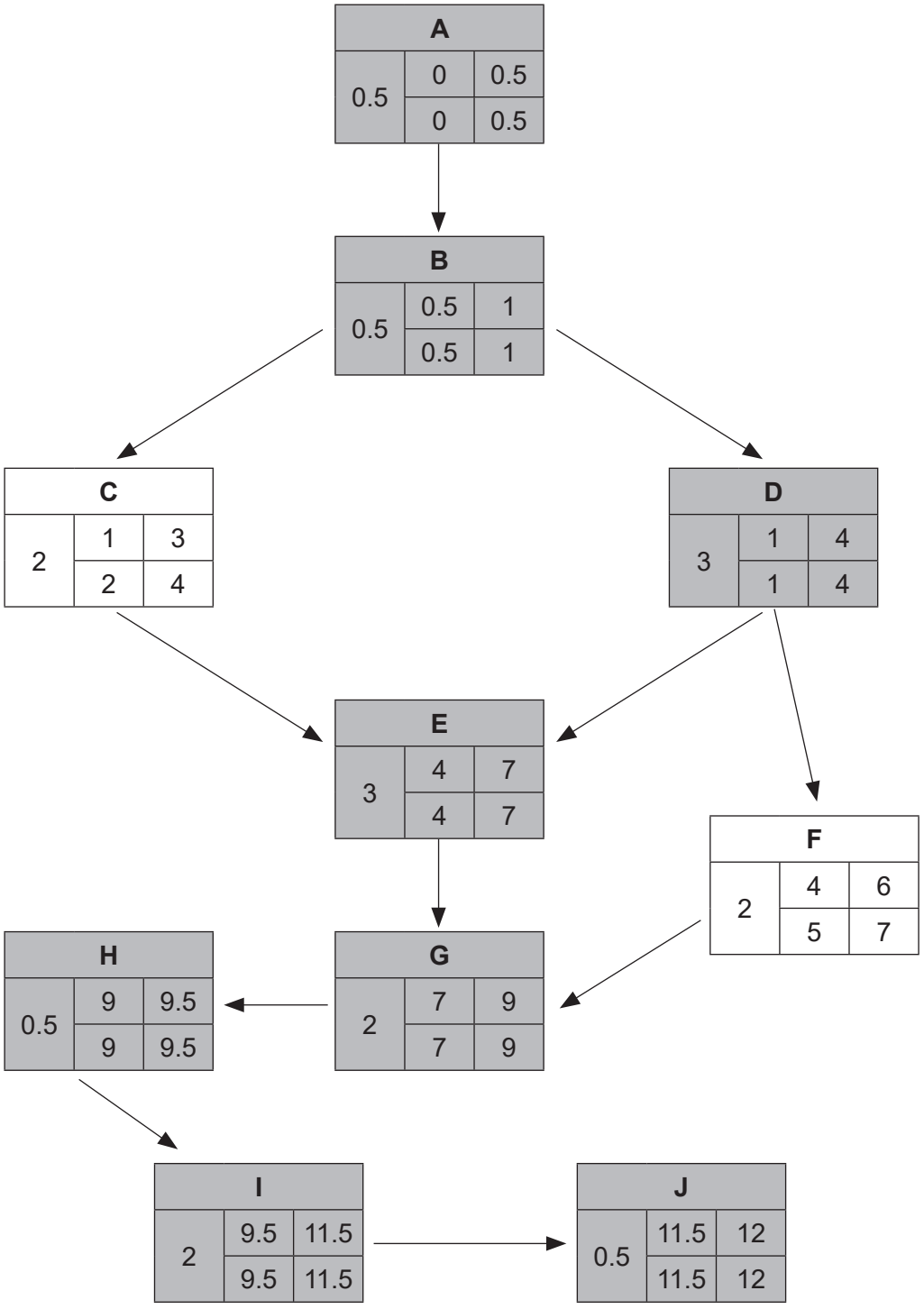
AVAILABLE MARKS

4 **(a)** Task H, agreeing the quotation, is a milestone. [1] This is a scheduled event indicating the completion of a deliverable/Completion of key phase/ marks a significant event. [1] [2]

(b) Any **two** from:
It is hard to see the critical path [1], which is the longest sequence of activities in a project, each of which must be completed on time for the project to finish on the due date [1]. Difficulty calculating float. [1] [2]

(c)



[1] for each box [9]

(d) Critical path (shaded) is *A*, *B*, *D*, *E*, *G*, *H*, *I*, *J* [1]

(e) No impact [1]

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AVAILABLE MARKS

5 **(a)** inheritance symbol/generalisation [1], because both customers and staff inherit the attributes and operations of a user. [1] [2]

(b) #username [1]
#password [1] [2]

(c) D or E [1]

(d) **(i)** How a (single) instance/object of one class [1]
is associated with multiple instances/objects of another class (in a relationship) [1]. [2]

(ii) One/each department will have one or more employees/can have many employees [1]
Each employee works for only one department [1] [2]

(e) Points may include:

- Use Case diagrams provide a high-level overview of the relationship between use cases, actors, and systems.
- They do not provide a lot of detail or show the order in which steps are performed.
- It is very important to gather information from a user's perspective, so Harry and Ted would be consulted to establish current processes within the landscaping and gardening strand, for example assigning staff to jobs, to build a picture of the interactions that will take place inside and outside the proposed system.
- Interactions are built into the use case diagrams with 'actors' (users that interact with a system) such as Harry or Ted or customers being represented by stick figures. The use cases are enclosed in an ellipse within a rectangle representing the system.
- The diagram will help to describe the functional requirements of a system; specify what the system should do, not how.
- A sequence diagram is a type of interaction diagram that focuses on the order that objects within a use case work together
- To assign staff to a landscaping job, a sequence of actions must take place over time in a specific order to establish which staff is available on specific date, so messages would be passed between Secretary, Booking and GardenStaff objects
- A sequence diagram will provide a higher level of detail than a Use Case and will explore the logic involved in realising the operations within a use case

Level 1 ([1]–[3])
Overall impression: Basic
Candidate provides a basic answer demonstrating limited knowledge and understanding of Use Case and Sequence diagrams.
Candidate provides a basic explanation of how Use Case and Sequence diagrams could be applied to landscaping and gardening at Thompsons.
Candidate makes only a limited selection and use of an appropriate form and style of writing.
The organisation of the material may lack clarity and coherence.
There is little use of specialist vocabulary.
Presentation, spelling, punctuation and grammar may be such that the intended meaning is not clear.

Level 2 ([4]–[6])
Overall impression: Good
Candidate provides a good answer demonstrating good knowledge and understanding of Use Case and Sequence diagrams.
Candidate provides a good explanation of how Use Case and Sequence diagrams could be applied to landscaping and gardening at Thompsons.
Candidate makes good selection and use of an appropriate form and style of writing.
Relevant material is organised with some clarity and coherence.
There is good use of specialist vocabulary.
Presentation, spelling, punctuation and grammar are used appropriately so the intended meaning is clear.

Level 3 ([7]–[8])
Overall impression: Excellent
Candidate provides an excellent answer demonstrating excellent knowledge and understanding of Use Case and Sequence diagrams.
Candidate provides an excellent explanation of how Use Case and Sequence diagrams could be applied to landscaping and gardening at Thompsons.
Candidate makes excellent selection and use of an appropriate form and style of writing.
Relevant material is organised with a high degree clarity and coherence.
There is excellent use of specialist vocabulary.
Presentation, spelling, punctuation and grammar are used to a high standard so the intended meaning is clear. [8] 17

AVAILABLE MARKS

AVAILABLE MARKS

6 (a)

Test Data	Reason for Test Data	Expected Outcome
Job Type: One Off Cost: 501	Check 10% deposit applied	10% deposit applied
Job Type: One Off **Cost: <=500**	Check no deposit applied	No deposit applied
Job Type: Contract Customer Type: Private Total Contract Cost: 2500 Duration (months): 1	Check flag for deposit required Ensure 5% deposit applied Ensure no discount applied	**Customer flagged for 5% deposit** **5% deposit applied** **No discount applied**
Job Type: Contract Customer Type: Private Total Contract Cost: 5000 Duration (months): 6	**Check flag for deposit required** **Check 5% discount applied** **Check 5% deposit applied**	**Customer flagged for 5% deposit** **5% discount applied** **5% deposit applied**
Job Type: Contract **Customer Type: Company** **Total Contract Cost: (Any cost)** **Duration (months): 3**	Check flag for deposit required Check 5% deposit applied Check no discount applied	Customer flagged for 5% deposit 5% deposit applied No discount applied
Job Type: Contract **Customer Type: Company/Private** **Total Contract Cost: (Any cost)** **Duration (months): 12**	Check flag for deposit required Check 5% deposit applied Check 8% discount applied	Customer flagged for 5% deposit 5% deposit applied 8% discount applied

[1] for each correct box [6]

(b) Points may include:

- Black box testing concentrates solely on inputs and outputs to test functionalities from a behavioral point of view. At Thomspons the end users, such as Harry can perform black box testing to examine whether the correct deposit is applied to a private customer when a 6 month contract is being created. Black box testing can help find bugs that the developers did not anticipate, thus increasing quality by addressing this.
- White box testing is concerned with the internal code and involves examining code/analysing algorithms, so it needs to be carried out by a programmer with a high level of understanding of the software architecture of the proposed system. At Thompsons, unit tests for the stock management systems could ensure that, for example, when stock levels fall below the reorder level, the correct events are triggered to alert the staff

Level 1 ([1]–[2])
Overall impression: Basic
Candidate provides a basic answer demonstrating limited knowledge and understanding of White Box and Black Box testing.
Candidate provides a basic explanation of how White Box and Black Box testing could be applied at Thompsons.
Candidate makes only a limited selection and use of an appropriate form and style of writing.
The organisation of the material may lack clarity and coherence.

There is little use of specialist vocabulary.
Presentation, spelling, punctuation and grammar may be such that the intended meaning is not clear.

Level 2 ([3]–[4])
Overall impression: Good
Candidate provides a good answer demonstrating good knowledge and understanding of White Box and Black Box testing.
Candidate provides a good explanation of how White Box and Black Box testing could be applied at Thompsons.
Candidate makes good selection and use of an appropriate form and style of writing.
Relevant material is organised with some clarity and coherence.
There is good use of specialist vocabulary.
Presentation, spelling, punctuation and grammar are used appropriately so the intended meaning is clear.

Level 3 ([5]–[6])
Overall impression: Excellent
Candidate provides an excellent answer demonstrating excellent knowledge and understanding of White Box and Black Box testing.
Candidate provides an excellent explanation of how White Box and Black Box testing could be applied at Thompsons.
Candidate makes excellent selection and use of an appropriate form and style of writing.
Relevant material is organised with a high degree clarity and coherence.
There is excellent use of specialist vocabulary.
Presentation, spelling, punctuation and grammar are used to a high standard so the intended meaning is clear. [6] 12

AVAILABLE MARKS

7 1NF

AVAILABLE MARKS

QUOTATION
QuotationNo, StartDate, Duration, CustNo, CustFName, CustSName, CustAdd1, CustAdd2, CustPostCode, CustTel, CustEmail, Labour

QUOTATION_STAFF
QuotationNo*, StaffID, StaffFName, StaffSName

QUOTATION_JOB
QuotationNo*, JobID, JobDesc

QUOTATION_JOB_MATERIAL
QuotationNo*, JobID*, MatID, MatDesc, Qty, UnitCost

[1] each correct table [4]

2NF

QUOTATION (unchanged)

QUOTATION_STAFF
QuotationNo*, StaffID*

STAFF
StaffID, StaffFName, StaffSName

QUOTATION_JOB
QuotationNo*, JobID*

JOB
JobID, JobDesc

QUOTATION_JOB_MATERIAL
QuotationNo*, JobID*, MatID*, Qty

MATERIAL
MatID, MatDesc, UnitCost

[1] New STAFF table
[1] New JOB table
[1] New MATERIAL table
[1] Any correct new FK [4]

3NF

QUOTATION
QuotationNo, StartDate, Duration, CustNo*, Labour

CUSTOMER
CustNo, CustFName, CustSName, CustAdd1, CustAdd2, CustPostCode, CustTel, CustEmail,

QUOTATION_STAFF (unchanged)
STAFF (unchanged)
QUOTATION_JOB (unchanged)
JOB (unchanged)
QUOTATION_JOB_MATERIAL (unchanged)
MATERIAL (unchanged)

[1] New CUSTOMER table
[1] FK added in QUOTATION
[1] PK added in CUSTOMER [3]

AVAILABLE MARKS

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AVAILABLE MARKS

8 **(a)**

```
create table SUPPLIERSTOCKORDER(

SupStockOrderID int primary key identity(1,1),

SupplierID int FOREIGN KEY REFERENCES SUPPLIER,

SupStockOrderDate date,

EstDeliveryDate date,

DeliveredYN char default 'N',

constraint ckDeliveryNotPast check(EstDeliveryDate >=
SupStockOrderDate))
```

[1] Create table
[1] SupStockOrder as primary key
[1] Correct use of identity
[1] default correct
[1] check correct (should include =) [5]

(b)

```
select CUSTOMER.CustSurname, CUSTOMER.CustForename,
CUSTOMER.CustAddress1, CUSTOMER.CustAddress2, CUSTOMER.
CustPostCode

from CUSTOMER

left join CUSTOMERORDER on CUSTOMERORDER.CustID =
CUSTOMER.CustID

Alternative to WHERE: HAVING COUNT (CUSTOMERORDER.OrderID) = 0
and...

where CUSTOMERORDER.OrderID is null and datediff(month,CUSTOMER.
RegistrationDate,getdate()) > 6

order by customer.CustSurname
```

[1] customer details selected
[1] correct from (Must be CUSTOMER)
[1] left join used
[1] tables joined correctly
[1] where customer order is null (should be is null/ Or COUNT, if implemented correctly)
[1] DateDiff or DateAdd function used
[1] Checks 6 months ago correctly
[1] order by correct [8]

			AVAILABLE MARKS
(c)	select sa.SaleAreaDesc, sum(st.SalePrice - st.CostPrice) * cod.Qty AS Total Profit From SALEAREA Sq join STOCK st on sa.SaleAreaID = st.SaleAreaID join CUSTORDERDETAILS cod on cod.StockID = st.StockID group by sa.SaleAreaDesc order by TotalProfit desc [1] select includes sales area description [1] sum used [1] SalePrice - CostPrice [1] *Qty [1] from [1] each correct join [1] group by [1] order by	[9]	22
		Total	**100**