New
Specification

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Rewarding Learning

ADVANCED
General Certificate of Education
2018

Software Systems Development

Unit A2 1

Systems Approaches and Database Concepts

[ADV11]

FRIDAY 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.

			AVAILABLE MARKS

1 **(a)** If opinion was sought from only one source then outcomes could be prejudiced.
Managers may not fully recognise issues on the ground
Range of opinion/wider view of what the problems are
Differing perspectives of company issues
Strategic objectives
Operational difficulties
[3] for explanation – any **three** from above or relevant alternative
[3] for sample input from Stephen and John and the secretaries   [6]

(b) **(i)** Advantages could include:
   • Actually witness processes and procedures
   • Can see at first hand what really happens
   • Opportunity to see problem areas
   • Can see things that may not have come across in an interview or by looking at documentation
   [1] for any advantage or any other relevant alternative

   Disadvantages could include:
   • Staff behaving differently
   • Staff resentment at being observed
   • Possible not to see everything
   • There may be other circumstances that arise on different days of the week or at different times/not all jobs occur at one time (reference to seasonal work)
   [1] for any disadvantage

   (ii) Observation could be conducted in the Office so that the office staff could be observed in the course of a normal day. The analyst could occupy a desk in an unobtrusive manner and make notes without interrupting the work of the staff.
   [2] for discussion of suitable instance (could be site visits)   [4]   10

2 Problem areas could include:
   • The length of time required for a call.
   • The difficulty in prioritisation.
   • The difficulty in generating calculations and discounts.
   • Problems with the arrangement of interviews
   • Problems in generating quotations
   • MisFiled documentation
Impact of these problems could include:
   • Loss of business/loss of profit
   • Customer dissatisfaction/causes disputes
   • Poor company image
   • Staff dissatisfaction

Level 1 ([1]–[2])
Overall impression: Basic
Candidate provides a basic answer demonstrating simple knowledge and understanding of some identified problems.
Candidate provides a limited description of some problems.
Candidate provides limited explanation of the impact of these problems on the business.
Candidate provides basic reference to examples from the case study
Candidate makes only a limited selection and use of an appropriate form and style of writing.
The organisation of material may lack clarity and coherence.

AVAILABLE MARKS

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 reasonable answer demonstrating good knowledge and understanding of a range of identified problems.
Candidate provides a good description of these problems.
Candidate provides a good explanation of the impact of these problems on the business.
Candidate provides good reference to examples from the case study
Candidate makes a reasonable selection and use of an appropriate form and style of writing.
Relevant material is organised with some clarity and coherence.
There is reasonable use of specialist vocabulary.
Presentation, spelling, punctuation and grammar are used appropriately to ensure that meaning is clear.

Level 3 ([5]–[6])
Overall impression: Excellent
Candidate provides an excellent answer demonstrating thorough knowledge and understanding of a range of identified problems.
Candidate provides an excellent description of these problems.
Candidate provides an excellent explanation of the impact of these problems on the business.
Candidate provides excellent reference to examples from the case study.
Candidate selects and uses the most appropriate form and style of writing.
Relevant material is organised with a high degree of clarity and coherence.
There is excellent use of specialist vocabulary.
Presentation, spelling, punctuation and grammar are used to a high standard to ensure that meaning is clear. [6]

6

3   The benefits of using a methodology could include any three of the following or any other valid reason;

* Using a methodology will provide a structure to the analysis and design process.
* This will help Connected Works to understand what is happening and will encourage cooperation from the staff.
* The use of a methodology will provide good communication between the developers and the users of the system.
* The use of a methodology is likely to establish good user requirements.
* The use of a methodology is likely to produce a well constructed quality product.
* The use of a methodology will minimise risks associated with the development.
* A methodology will assist the management and control of the project.
* The use of a methodology is likely to minimise overall costs.
* Lets the user have more influence on how the system is developed

[2] for each of three well explained reasons/benefits.
[1] for benefit [1] for explanation [6]

6

AVAILABLE MARKS

4 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.

Prototyping can help resolve misunderstanding between developers and users early in the development process.

Areas that were overlooked can be identified in the prototype and requirements can be amended before a complete system is implemented.

Users are more likely to understand the system using a prototype than by reading requirements specifications.

Prototyping can be used for training purposes as users will become familiar with aspects of the final system throughout the development process.

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'.

Some important functions may be left out to speed the development of the prototype. The user may have a limited view of how the final system will work.

Reverse Engineering not strictly prototyping but uses lines of code that are already written that may be used for the new system.

Prototyping could be used in Connected Works to model aspects of the system quickly and to enable users to participate fully in shaping the final product. A model of how quotations could be generated could be constructed allowing users to comment on ease of use and suitability.

Level 1 ([1]–[3])
Overall impression: Basic
Candidate provides a basic answer demonstrating simple knowledge and understanding of prototyping.
Candidate provides a limited description of the characteristics of prototyping.
Candidate may refer briefly to types of prototyping.
Candidate provides limited explanation of the use of prototyping in the business.
Candidate provides examples of how prototyping could be applied in the development process at Connected Works.
Candidate makes only a limited selection and use of an appropriate form and style of writing.
The organisation of 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.

AVAILABLE MARKS

Level 2 ([4]–[6])
Overall impression: Good
Candidate provides a good answer demonstrating good knowledge and understanding of prototyping.
Candidate provides a good description of the characteristics of prototyping.
Candidate provides a good explanation of types of prototyping.
Candidate provides a good explanation of the use of prototyping in the business.
Candidate provides good examples of how prototyping could be applied in the development process at Connected Works.
Candidate makes a good selection and use of an appropriate form and style of writing.
Relevant material is organised with good clarity and coherence.
There is good use of specialist vocabulary.
Presentation, spelling, punctuation and grammar are used appropriately to ensure that meaning is clear.

Level 3 ([7]–[8])
Overall impression: Excellent
Candidate provides an excellent answer demonstrating thorough knowledge and understanding of prototyping.
Candidate provides an excellent description of the characteristics of prototyping.
Candidate provides an excellent description of types of prototyping.
Candidate provides an excellent example of the use of prototyping in the business.
Candidate provides excellent examples of how prototyping could be applied in the development process at Connected Works.
Candidate selects and uses the most appropriate form and style of writing.
Candidate provides examples of how prototyping could be applied in the development process at Connected Works.
Relevant material is organised with a high degree of clarity and coherence.
There is excellent use of specialist vocabulary.
Presentation, spelling, punctuation and grammar are used to a high standard to ensure that meaning is clear. [8]

8

	AVAILABLE MARKS

5 Testing is conducted in order to find errors in a software system. Testing takes place all through the development life cycle and commences at the ___**design**_____ stage. Finding errors at an early stage in the development is important as this can reduce time and save money. The product must be fit for purpose.

Testing sections of code in isolation to ensure that they function correctly is known as ___**program**_____ testing. This type of testing is conducted by the ___**programmer**___.

Where the whole system is treated like a black box and the internal working of the code is not checked the type of testing is called ___**system**__ testing . This involves testing a complete ___**system**_____ with all the _____ **sub systems** _____ integrated together.

Every systems specification should contain a test plan. This plan should contain a description of each test, ____**test data**___, expected outcome, actual outcome and __**corrective action** __.

Testing conducted by _____**users**____ at the end of the development cycle is called __**acceptance**____testing.
[1] for each correct word or phrase   [10]
'test data' and 'corrective action' are interchangeable

10

6 Candidates should indicate that diagrams convey much more meaning to people than words.

It should be noted that UML uses graphical representation of systems, Diagrams associated with UML represent different views of the same system. This will assist a greater understanding of all the components that comprise the system.

Candidates should note important features of: Use Case, Class and Sequence diagrams.

Use Case diagrams consider the way a system works from the user's point of view. It is very important to gather information from a user's perspective. These diagrams comprise 'actors' represented by' stick figures. The use case is enclosed in an ellipse within a rectangle representing the system. The actor is placed outside the rectangle

In the Class diagram, candidates should note that a class is a category or group of items that have common attributes and behave in the same way. The diagram consists of a rectangle divided into three sections. The top section contains the name, the middle section, the attributes and the bottom section the operations. Class diagrams are connected by lines to show how the classes interact with each other. They can help discussion developers and users and help establish detail about the system, This would apply to Connected Works.

Sequence diagrams show how objects interact with each other over time. Some code and database elements can be automatically constructed.
Use case/sequence models the dynamic/behavioural aspect.

Level 1 ([1]–[3])
Overall impression: Basic
Candidate provides a basic answer demonstrating simple knowledge and understanding of UML, Use Case, Class and Sequence diagrams.
Candidate provides a limited description of diagrams.

Candidate provides basic reference to the use of these diagrams in the development of a new system at Connected Works.

Candidate provides limited evaluation of the use of these diagrams in the development of a new system at Connected Works.

Candidate provides a limited answer demonstrating basic knowledge and understanding of UML and its application.

Candidate makes only a limited selection and use of an appropriate form and style of writing.

The organisation of 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]–[7])
Overall impression: Good
Candidate provides a good answer demonstrating good knowledge and understanding of UML, Use Case, Class and Sequence diagrams.

Candidate provides a good description of diagrams.

Candidate provides good reference to the use of these diagrams in the development of a new system at Connected Works.

Candidate provides good evaluation of the use of these diagrams in the development of a new system at Connected Works.

Candidate provides a good answer demonstrating good knowledge and understanding of UML and its application.

Candidate makes a reasonable 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 to ensure that meaning is clear.

Level 3 ([8]–[10])
Overall impression: Excellent
Candidate provides an excellent answer demonstrating thorough knowledge and understanding of UML, Use Case, Class and Sequence diagrams.

Candidate provides an excellent description of diagrams.

Candidate provides excellent reference to the use of these diagrams in the development of a new system at Connected Works.

Candidate provides excellent evaluation of the use of these diagrams in the development of a new system at Connected Works.

Candidate provides an excellent answer demonstrating thorough knowledge and Understanding of UML and its application.

Candidate selects and uses the most appropriate form and style of writing.

Relevant material is organised with a high degree of clarity and coherence.

There is excellent use of specialist vocabulary.

Presentation, spelling, punctuation and grammar are used to a high standard to ensure that meaning is clear. [10]

10

		AVAILABLE MARKS

7 **(i)** private customer (Allow customer/client)

 (ii) Stephen/John/senior staff/owners (**not** managers)

 (iii) Manage site visit

 (iv) Stephen/John/owners/senior managers

 (v) <<include>>

 (vi) <<extend>>

 (vii) file system/allow office staff

 (viii) Use Case [8]
 note: roles are preferred but names are acceptable

8 **(a)** **(i)** Give an example of a derived field that does not need to be included in the normalisation process.

 Cost/vat/total/discount/subTotal [1]

 (ii) give an example of a non atomic field indicating the breakdown required.

 Staff name [1]

 Forename – David, surname – Murray [1] /relevant breakdowns
 Allow customer name or address and relevant breakdowns [2]

 (b) Transform the data into third normal form showing:

 Un-normalised data

 QuotationNo, QuotationDate, StaffNo,StaffSurname, StaffForename,

 CustomerNo, CustomerSurname, CustomerForename, CustomerAddress1, CustomerAddress2, CustomerTelNo,

 {JobNo,JobType, Duration, {MaterialNo, Material, QtyRequired, Price,}} LabourCost

 Ist Normal Form

 QUOTATION
 (QuotationNo, QuotationDate, StaffNo,StaffSurname, StaffForename, CustomerNo, CustomerSurname, CustomerForename, CustomerAddress1, CustomerAddress2, CustomerTelNo, LabourCost)

 correct fields removed [1]

 P K [1]
 QUOTATIONJOB (QuotationNo*, JobNo, JobType, Duration)

 C K [1]

 FK [1]

8

	AVAILABLE MARKS

QUOTATIONJOBMATERIAL
(<u>QuotationNo</u>*, <u>JobNo</u>*, <u>MaterialNo</u>, Material, QtyRequired, Price)

C K   [1]

Both F K's   [1]

2nd Normal Form

QUOTATION   unchanged

QUOTATIONJOB (<u>QuotationNo</u>*, <u>JobNo</u>*, Duration)
JOB (<u>JobNo</u>, JobType)

QUOTATIONJOBMATERIAL (<u>QuotationNo</u>*, <u>JobNo</u>*, <u>MaterialNo</u>*, QtyRequired)
MATERIAL   (<u>MaterialNo</u>, Material, Price)

correct fields removed [1]
either new F K [1]
either P K [1]

3rd Normal Form

QUOTATIONJOB, JOB, QUOTATIONJOBMATERIAL, MATERIAL unchanged

QUOTATION (<u>QuotationNo</u>, QuotationDate, StaffNo*, CustomerNo*,
LabourCost)

correct fields removed [1]
either F K [1]

STAFF   (<u>StaffNo</u>, StaffSurname, StaffForename)
CUSTOMER
(<u>CustomerNo</u>, CustomerSurname, CustomerForename, CustomerAddress1,
CustomerAddress2, CustomerTelNo)

either table completely correct [1]   15

9 JobNo, StaffNo + correct data types   [2]

CK – All 3 fields underlined   [1]

FK - [1] for each field starred   [3]   6

10 Using the database structure for Contracts given in Question 9 :

(a) write the SQL scripts to complete the constraints for the following CREATE TABLE CONTRACT where:

constraint   fkCustomerNo   foreign key (customerNo)   references   Customer(customerNo) ,
constraint   fkFee foreign key   (feeNo) references Fee(feeNo),
constraint   ckStartDate   check (startDate >= getDate()),
constraint   ckEndDate check (endDate >startDate)
)

(FK [2], [1] for each correct)   Note- Ignore field brackets/Function brackets and commas throughout.
([1] use of getDate() function)
(CKStartDate current or in future [1])
(CKEndDate [1] for criteria,   [5]

(b) (i) Stephen requires a list of all non-urgent jobs to be carried out in the coming week.
These are contract jobs with the following criteria:
the last date carried out is null;   or
Frequency – W   or
Frequency – M and the last date carried out is 23 or more days ago;

The list should include the customer's name and address, job type and skill required.
Should be ordered by JobNo.

[1] Select j.JobNo, JobType, DateLastCarriedOut, CustomerForename, CustomerSurname, customerAddress1,CustomerAddress2, skill   (minimum of 5 items including jobNo, jobType, skill)
[1] from contractJob cj
[1] join Job j   on j.jobNo=cj.jobNo
[1] join Skill s on   j.skillNo = s.SkillNo
[1] join Contract c   on c.contractNo = cj.contractNo
[1] join Customer cc   on cc.customerNo = c.customerNo
where   DateLastCarriedOut is null
or (required)
[1] Frequency = 'W'
    or
[1] Frequency = 'M' and [1] DateLastCarriedOut < = dateadd(day,-23,getDate())

[1] order by jobNo   (Allow DateDiff)   [11]
[1] for each correct line

(ii) Name one other check that **must** be implemented
Within Contract StartDate and ContractEndDate   [1]
check year

(c) Count the number of new contracts for each fee number. A new contract has a start date in the future.

select feeNo, count(feeNo) as 'Number of new Contracts'
from   contract
where startDate > getDate()
group by feeNo

[1] for each correct line
(WHERE should be used as HAVING is not efficient)   [4]   21

                                          Total   **100**