



*Rewarding Learning*

**ADVANCED  
General Certificate of Education  
2017**

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## **Software Systems Development**

Unit A2 1

Systems Approaches and Database  
Concepts

**[A2S11]**

**WEDNESDAY 24 MAY, AFTERNOON**

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# **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.

1

<p><b>(a) Interviewing Reception staff</b></p> <p>Facilitates two-way exchange of information allowing for expansion and probing questions.</p> <p>Interviewer can pick up on non-verbal cue which may lead to other areas of concern.</p> <p>Enables a working knowledge of procedures to be determined. Identify deviations from expected procedures with possible explanations;</p> <p>Determine difficulties encountered; Investigate new ideas/suggestions for improvements;</p> <p>Gain buy in from key personnel;</p> <p>Identify specific documents that are currently used.</p> <p><b>1 mark each for any two</b></p>	<p><b>Example</b></p> <p>Provide a relevant example to justify suitability of interviewing.</p> <p>Gain an understanding of how bookings are processed, for room, spa, facilities etc.</p> <p>Get copies of diary pages.</p> <p>Get comments on possible improvements and current difficulties from receptionist. Difficulties such as calculating discounts; ensuring full bill is visible at time of check out; return of rented items etc.</p> <p><b>Or any other valid example.</b></p> <p><b>1 mark each for any two supporting examples</b></p>
<p><b>(b) Observation</b></p> <p>Or Document Research</p> <p><b>1 mark</b></p>	<p>Note actual processes first-hand against required procedures. Analyse the documentation to facilitate data analysis.</p> <p><b>1 mark</b></p>
<p><b>(c) Major problems:</b></p> <p>Double booking rooms/restaurant Discounts incorrect. Spa treatments not included in final bill Rented items not returned or charged for</p> <p><b>1 mark any valid major problem</b></p>	<p>Dissatisfied guests leading to bad publicity and no repeat bookings. Loss of revenue. Possible loss of equipment.</p> <p><b>1 mark any supporting impact</b></p>

[8]

**AVAILABLE MARKS**

8

## 2 Roles and responsibilities of the Project manager

AVAILABLE  
MARKS

Students may provide some of the following information in more or less depth. They are not expected to provide all information for full marks.

Project Manager Roles:

- Defines requirements – must be agreed by Manager of The Haven
- Builds the team – development team plus representatives from The Haven – Manager and Users
- Plans the project – Identify possible project methodology, Gantt Charts, Pert Charts, Burn-down Charts. Project management software, Critical path analysis
- Defines scope and parameters – user requirements, feasibility study
- Communicates goals to the team – meetings, email, charts
- Progress reporting – to Manager at The Haven and rest of team
- Documentation – user reqs, system spec, test plan, technical guides
- Risk analysis
- Identify bottlenecks
- Identifies interim project targets to be achieved
- Allocates budget – as agreed by Manager at The Haven
- Ensures targets are adhered to – project deliverables, user sign-off, corrective action
- Monitoring and control

### Level 1 ([1]–[2])

#### Overall Impression: Basic

Candidate provides a basic answer demonstrating limited understanding of the roles and responsibilities of project manager throughout system development. Candidate makes little reference to the people, tools and techniques used throughout the system development lifecycle and provides little evaluation of their importance.

The 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 intended meaning is not clear.

### Level 2 ([3]–[4])

#### Overall Impression: Good

Candidate provides a good answer showing a reasonable understanding of the roles and responsibilities of project manager throughout system development. Candidates make some reference to the people, tools and techniques used throughout the system development lifecycle and provide some evaluation of their importance.

The candidate makes a reasonable selection and use of an appropriate form and style.

The 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 some use of appropriate specialist vocabulary.

Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

**Level 3 ([5]–[6])**

**Overall Impression: Excellent**

Candidate provides an excellent answer showing thorough understanding of the roles and responsibilities of project manager throughout system development.

Candidates demonstrate a detailed knowledge of the people, tools and techniques used in the various stages of the system development lifecycle.

Candidates critically evaluate the importance of tools and techniques at several stages of the project development lifecycle for project management purposes.

The candidate makes a reasonable selection and use of an appropriate form and style.

The candidate successfully 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 widespread and accurate use of appropriate specialist vocabulary.

Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

All other valid answers will be given credit. [0] awarded for a response not worthy of credit.

[AO1, AO3]

[6]

6

AVAILABLE  
MARKS

**3 SCRUM**

AVAILABLE MARKS

(a)

Responsibility	Product Owner	Scrum Master	Development Team
Prioritises Product Backlog items.	✓		
Removes impediments to progress.		✓	
Defines acceptance criteria for each Product Backlog item.	✓		
Ensures the time of each timebox never exceeds 15 minutes.		✓	
Determines which high priority subset of the Product Backlog should be built into a sprint.			✓

[1] for each correct row × 5  
[AO1]

[5]

- (b) [1] iteration  
 [1] properly sequenced diagram  
 [2] jargon [1] for any three terms
- sprint retrospective
  - product backlog
  - sprint review
  - daily scrum
  - sprint planning
- outcome }  
 release }  
 increment }

SEQUENCE  
 ITERATION  
 TERMS

[4]

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#### 4 Suitability of Methodologies

Students may consider some of the areas below for suitability. They are not expected to provide all information for full marks.

##### XP

General approach – release quickly and if it is not correct fix and release again.

- Quick delivery
- More suitable for small teams as intense communication required
- High user satisfaction
- High quality
- Target smaller task-based projects
- May not be robust enough to handle large scale interaction between users and programmers
- Uses paired programming

##### DSDM

Assumes that no system is perfect on first release

- 80% solution in 20% of time
- Priorities must be set – MOSCOW
- Reversibility possible at every phase
- Full user requirements will only come with time – ie. Once initial system is in place – following refinements.
- Testing is not a phase – it occurs constantly.

Both methods have high user involvement and frequent revision in common.

Due to the fact that The Haven requires a complex system with many functional strands XP would not be a suitable methodology, for example the final billing process which includes rooms, facilities, restaurant and spa costings.

XP does not cover the full project management lifecycle and business documentation like the Terms of Reference [specified in DSDM] is not mentioned; providing realistic estimate of cost and scope is difficult (as it isn't defined up front) – Hugh might expect this as part of any contract negotiation;

Little up front design in XP (minimal documentation – code often used) may cause difficulties when integrating a large system covering many business areas in The Haven;

At The Haven the project involves replacing an existing manual system – most of the requirements will be well understood and the processes involved are standard business functions that have standard solutions – possibly developed previously – DSDM is more suitable.

AVAILABLE  
MARKS

**Level 1 ([1]–[2])**

**Overall Impression: Basic**

Candidate provides a basic answer demonstrating simple knowledge of the practices of the XP and DSDM methodologies and their suitability for The Haven project.

Candidates outline few main practices of both methodologies but little assessment of suitability.

The 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 intended meaning is not clear.

**Level 2 ([3]–[5])**

**Overall Impression: Good**

Candidate provides a good answer showing a reasonable understanding of the practices of the XP and DSDM methodologies and their suitability for The Haven project.

Candidates outline some main practices of both methodologies.

Candidates broadly assess the overall suitability of the methodologies for The Haven project.

The 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 some use of appropriate specialist vocabulary.

Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

**Level 3 ([6]–[8])**

**Overall Impression: Excellent**

Candidate provides an excellent answer showing thorough understanding of the practices of the XP and DSDM methodologies and their suitability for The Haven project.

Candidates outline several main practices of both methodologies.

Candidates critically assess of the suitability of both methodologies for The Haven project.

The candidate makes a reasonable selection and use of an appropriate form and style.

The candidate successfully 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 widespread and accurate use of appropriate specialist vocabulary.

Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

All other valid answers will be given credit. [0] awarded for a response not worthy of credit.

[AO1, AO3]

[8]

8

**5 Use Case**

- (a) (i) Customer or Guest
- (ii) Receptionist
- (iii) Manager – acceptable names
- (iv) Craft Shop

([1] × 4)  
[AO2, AO3]

[4]

- (b) Useful to take out common functionality – do not have to repeat specification.  
[1] suitable description  
[1] jargon – extended functionality
  - optional
  - common
  - base
 [1] related to The Haven diagram  
 Process Payment is the extended use case which is meaningful on its own.  
 The dashed arrow indicates the extending use case. Cancel Booking defines optional behaviour that is not meaningful by itself. Make Booking is an example of a supplementary extending use case.  
 [AO3]

[3]

7

**6 Class Model**

- (a) • Guest makes Payment [ 1 0...\* ]
  - Booking reserves Room [1 1...\* ]
  - Room has a Room Type [1...\* 1]
  - NightlyRate – attribute box of Room Type  
RoomServiceCharge – attribute box of Room
  - ProduceBill () in operation box of FinalBill  
accept ProduceBill () in operation box of Booking–**BOD**
- [1] each correct addition to class diagram × 6  
[AO1, AO2]

[6]

- (b) Candidates show one difference clearly.  
(Allow valid alternatives):
    - **Analysis:** High level overview or representation of objects in real world with little detail – used for requirements elicitation with business/user representatives.  
*versus*
    - **Design:** Shows the software classes and possibly datatypes and implementation details of the language used for example interface classes – specification for programmers.
- [AO3]

[1]

7

AVAILABLE MARKS
7
7

## 7 Testing

AVAILABLE  
MARKS

(a) The candidate may include:

- Program/unit testing
- Systems testing
- Acceptance/Integration testing
- White box/black box
- Design testing – ensure user requirements are met
- People involved – users/developers/analysts

**Overall Impact errors:** Low quality software could cause: loss of money – this can include losing customers right through to financial penalties for non-compliance to legal requirements – does it enforce regulations for horse trekking staff ratios; Loss of time – bill production may take a long time – staff may not be able to work due to a fault or failure; damage to business reputation.

**Unit:** performed by developers, small unit such as a class - for example discount calculation error.

**System:** performed by analyst to test how the units and subsystems work together to meet functional and non-functional requirements – for example if the receptionist wants to produce a bill for a customer – details must be available relating to all charges – spa, restaurant etc.

**Acceptance:** performed by the users such as the receptionist and managers. It is important that the system meets the business needs and is preferable to the current manual system.

### Level 1 ([1]–[2])

#### Overall Impression: Basic

Candidate provides a basic answer demonstrating simple knowledge of the importance of testing The Haven system and types of testing.

Candidates discuss the overall importance of testing with few or no examples to show the overall impact of errors with some examples specific to the type of testing.

The 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 intended meaning is not clear.

### Level 2 ([3]–[5])

#### Overall Impression: Good

Candidate provides a good answer showing a reasonable understanding of the importance of testing The Haven system and types of testing.

Candidates discuss the overall importance of testing using some broad examples to show the overall impact of errors.

The 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 some use of appropriate specialist vocabulary.

Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

**Level 3 ([6]–[8])****Overall Impression: Excellent**

Candidate provides an excellent answer showing thorough understanding of the importance of testing The Haven system and types of testing.

Candidates discuss the overall importance of testing using specific examples to show the overall impact of errors.

The candidate makes a reasonable selection and use of an appropriate form and style.

The candidate successfully 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 widespread and accurate use of appropriate specialist vocabulary.

Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

All other valid answers will be given credit. [0] awarded for a response not worthy of credit.

[AO1, AO3]

[8]

(b) Specific dates on the boundaries preferred.

Test Data	Reason for Test Data	Expected Result
Booking Date: Current date Check-in date: < 3 months New guest: YES	Identify where no discount applies	Rate applied = 0
Booking Date: Current date Check-in date: >=3 and <6 mths. New guest: YES	Identify where rate of 5% applies	Rate applied = 5
Booking Date: Current date Check-in date: >=6 mths. New guest: YES	Identify where rate of 10% applies	Rate applied = 10
Any of the above with New guest: NO	Identify where additional discount applies	+5
Special Offer	Ensure no discount applied	0

[1] for each valid test

[5]

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AVAILABLE  
MARKS

8 NORMALISATION

AVAILABLE MARKS

- (a) Cost or No of Items [AO2] [1]
- (b) Contains Repeating Group: ItemNo, ItemDescription, Returned? [1] for repeating group & [1] for fields, [AO3] [2]
- (c) Answer shows each field identified with the first letter of each word and # to stand for number or ID. Foreign keys are represented with \*. Repeating groups are contained within {}. Students may name the tables differently. Ignore non decomposition of staff name and derived fields if in correct table; **Unnormalised Table:**

**DailyHire** (HireDate, StaffNo, StaffName, RoomNo, HireNo, {ItemNo, ItemDesc, Returned})

**First Approach: Split unnormalised table**

1st Normal Form [Remove Repeating Groups – in {}]	2 tables, 2 primary keys, 1 foreign key <b>DailyHire</b> ( <u>HireNo</u> , HireDate, RoomNo, StaffNo, StaffName) <b>HireLine</b> ( <u>HireNo*</u> , <u>ItemNo</u> , ItemDesc, Returned)	[1] for removing HireLine fields in DailyHire Table and inserting into HireLine Table. All fields identified. [2] for identifying primary key of DailyHire and associated foreign key in HireLine. [1] for identifying composite primary key of HireLine.
2nd Normal Form [Remove Partial Dependencies].	3 tables, 3 primary keys, 2 foreign key <b>DailyHire</b> ( <u>HireNo</u> , HireDate, RoomNo, StaffNo, StaffName) <b>HireLine</b> ( <u>HireNo*</u> , <u>ItemNo*</u> , Returned) <b>Item</b> ( <u>ItemNo</u> , ItemDesc)	[1] Removing items fields from HireLine and inserting into Item [1] Identify ItemNo to foreign key in HireLine [1] ItemNo as primary key in Item
3rd Normal Form [Remove Transitive Dependencies].	4 Tables, 4 primary keys, 3 foreign keys <b>DailyHire</b> ( <u>HireNo</u> , HireDate, RoomNo, StaffNo*) <b>HireLine</b> ( <u>HireNo*</u> , <u>ItemNo*</u> , Returned) <b>Item</b> ( <u>ItemNo</u> , ItemDesc) <b>Staff</b> ( <u>StaffNo</u> , StaffName)	[1] for removing Staff fields in DailyHire and inserting into Staff Table. [2] for identifying primary key in Staff table and associated foreign key in DailyHire.

[AO1] & [AO2] & [AO3]

[10]

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9 SQL

AVAILABLE  
MARKS

- **INSERT INTO Booking**  
 (BookingNo, BookingDate, CheckInDate, NoOfNights, BookingStatus,  
 NoOfAdults, NoOfChildren, GuestNo)  
 VALUES('B101', '2017/05/01', '2017/06/24', 5, 2, 2, '1004')

**INSERT INTO BookingDetails** (BookingNo, RoomNo) VALUES('B101', 6);

Insert Into Booking [1]  
 Values [2]  
 [1] Correct fields - BookingDetails  
 Insert into BookingDetails [1]  
 Values [1]  
 [AO1], [AO2] [5]
- **UPDATE Booking**  
 SET BookingStatus='Cancelled'  
 WHERE BookingNo='B102';

[1] for each correct line x 3, [AO1], [AO2] [3]
- **SELECT** FirstName + ' ' + Surname, CheckInDate, Room.RoomNo,  
 RoomDescription,  
 DATEDIFF(MONTH, BookingDate, CheckInDate) As MonthsInAdvance,  
 FROM Booking  
 JOIN Guest on Booking.GuestNo=Guest.GuestNo  
 JOIN BookingDetails on Booking.BookingNo=BookingDetails.BookingNo  
 JOIN Room on BookingDetails.RoomNo=Room.RoomNo  
 JOIN RoomType on Room.TypeNo=RoomType.TypeNo  
 WHERE Booking.BookingNo='B103';

[2] DATEDIFF  
 [1] for every other correct line x 7  
 [AO1], [AO2] [9]
- **SELECT** TypeNo, COUNT(\*)  
 FROM ROOM  
 GROUP BY TypeNo

[1] for each correct line x 3, [AO1], [AO2] [3]

20

10 ER MODEL TO RELATIONAL TABLES

Table	Primary Key	Foreign Key
TREATMENT	<u>TreatmentNo</u>	None
STAFF	<u>StaffNo</u>	None
STAFFSKILL	<u>StaffNo</u> <u>TreatmentNo</u>	<b>StaffNo</b> <b>TreatmentNo</b>
APPOINTMENT	<u>AppointmentNo</u>	<b>TreatmentNo</b> <b>BookingNo</b> <b>RoomNo</b> <b>StaffNo</b>

- [1] correct primary key for TREATMENT table
- [1] both foreign keys in STAFFSKILL table
- [1] correct primary key for APPOINTMENT table
- [2] all correct foreign keys in APPOINTMENT (1 mark for any 2 correct) [5]

- (b) Examples of constraints could include:
- Required Data – Staff Surname and First Name must be present – NOT NULL.
  - Domain constraints – AvailabilityStatus must be from a restricted set such as [Yes, Not Working, Sick, On Leave] – can add a CHECK constraint.
  - Primary Keys – Must be unique and not null for example StaffNo; could also talk about alternate keys such as email – can use UNIQUE keyword.
  - Referential Integrity – Foreign key value must exist in parent primary key field – for example the value of Customer No in TIMESLOT must match a Customer No in CUSTOMER – important when deleting and inserting data.

[2] for type of constraint and example x 2, [AO3] [4]

**Total**

AVAILABLE MARKS
9
<b>100</b>