



Rewarding Learning

ADVANCED

General Certificate of Education

2015

Centre Number

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Candidate Number

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Software Systems Development

Unit A2 1:

Systems Approaches and Database Concepts



A2S11

[A2S11]

MONDAY 11 MAY, AFTERNOON

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

This paper is accompanied by a Pre-release Case Study. You must **not** use your own annotated copy of this Case Study.

Write your answers in the spaces provided in this question paper.

Answer **all ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in **questions 7(a), 7(b) and 10**.

For Examiner's use only			
Question	Marks available	Marks	Remark
1	4		
2	6		
3	18		
4	6		
5	6		
6	9		
7	12		
8	9		
9	18		
10	12		
Total	100		

- 1 Jennifer, the Senior Analyst at Future Solutions, is considering a range of approaches for her team to use in the development at Deeper Dives. Give one advantage and one disadvantage of using each of the following methodologies at Deeper Dives.

WATERFALL

Advantage: _____
_____ [1]

Disadvantage: _____
_____ [1]

SCRUM

Advantage: _____
_____ [1]

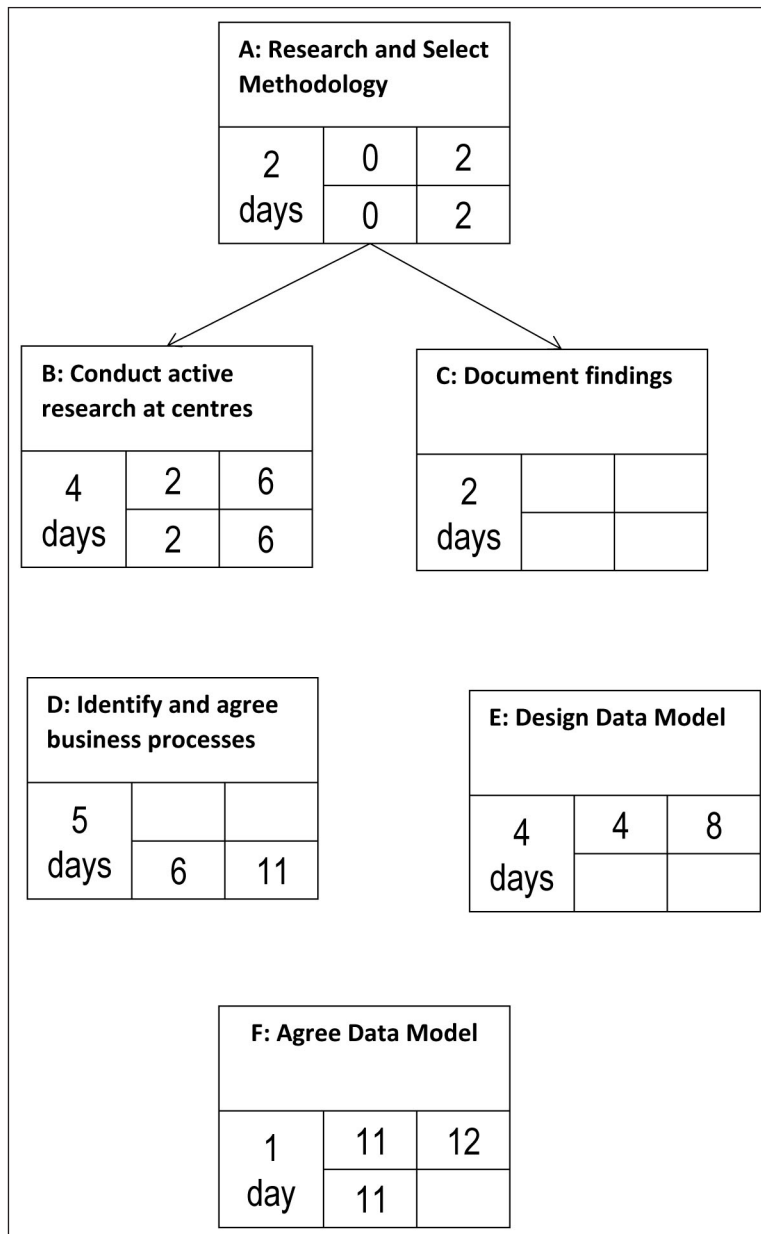
Disadvantage: _____
_____ [1]

Examiner Only	
Marks	Remark

3 Bill has created the precedence table shown below for some of the activities associated with the development process at Deeper Dives.

Activity	Description	Duration (days)	Precedence
A	Research and select methodology	2	–
B	Conduct active research at centres	4	A
C	Document findings	2	A
D	Identify and agree specific business processes	5	B,C
E	Design data model	4	C
F	Agree data model	1	D,E

(a) Complete the PERT chart below:



[14]

Examiner Only	
Marks	Remark

(b) Using the PERT chart opposite explain how the following delay would affect the overall schedule.

Activity B: Conduct active research at centres started on day 4 instead of day 2.

[2]

(c) Explain how the Project Manager could try to deliver the project on time when a task on the critical path has been delayed.

[2]

Examiner Only	
Marks	Remark

- 4 Jennifer has outlined some obvious problems with the current system to Darren and has indicated the possible use of a database to resolve them.

Complete the table below, clearly stating the problem, the impact of the problem and how a database solution would help resolve the issue.

Problem	Impact	Database
	Dive cancelled	
		Concurrent access to database
Loss of course diary		

[6]

Examiner Only	
Marks	Remark

5 Jim prepares the Test Plan.

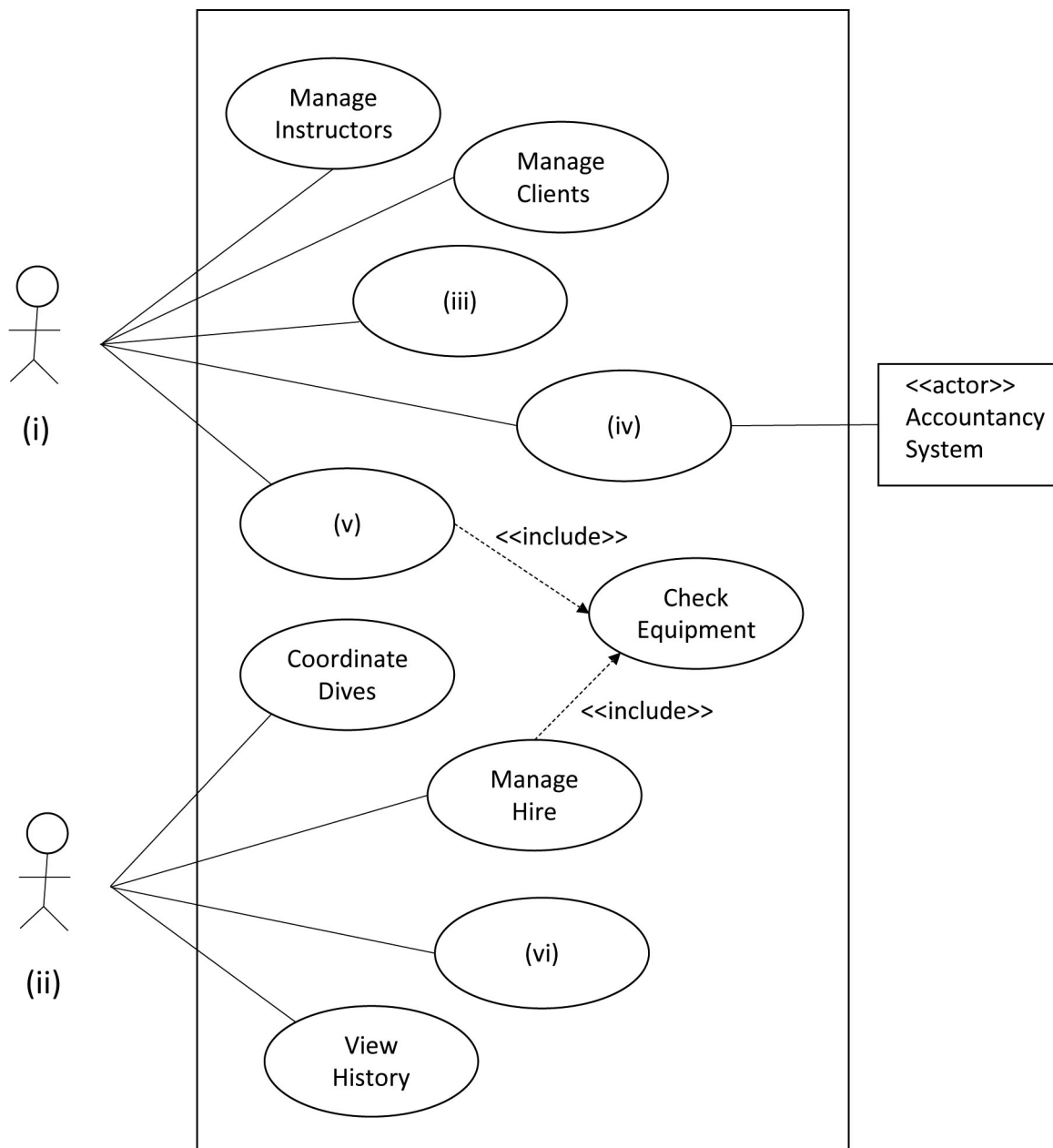
Determine if the following statements are either true or false. Insert the word **true** or **false** opposite each statement.

Test planning should only begin after implementation to improve software quality.	
Acceptance testing involves clients examining program code.	
Unit testing can be planned even before the code has been written.	
Integration testing may involve examining how software objects work together to achieve a user goal.	
Alpha testing will be performed in a Deeper Dives Centre using real data.	
It would not be cost effective to test all possible user inputs in the Deeper Dives System.	

[6]

Examiner Only	
Marks	Remark

6 Jennifer, the analyst, uses the Unified Modelling Language, UML, to visualise and document the system she is developing for Deeper Dives.



- (a) Complete the Use Case diagram opposite by selecting the most appropriate option from the list below.

Manager	Design Database	Repair Boat	Clean Pool
Client	Sophie	Award Certificates	Instructor
Calculate Wages	Co-ordinate Courses	Analyst	Manage Stock

- | | |
|-------------|------------|
| (i) _____ | (iv) _____ |
| (ii) _____ | (v) _____ |
| (iii) _____ | (vi) _____ |

[6]

- (b) Explain the meaning of the «include» relationship between the Manage Hire and Check Equipment Use Case.

_____ [1]

- (c) Jennifer will also draw a CLASS diagram. Describe what this diagram should show.

_____ [2]

Examiner Only	
Marks	Remark

7 (a) Discuss the advantages of using a relational database management system (RDMS) at Deeper Dives.

[6]

Examiner Only	
Marks	Remark

(b) Entity Relationship Modelling and Normalisation are approaches used to develop data models. Explain their use in the development process at Deeper Dives.

[6]

Examiner Only	
Marks	Remark

- 8 Examine the Hire Agreement form that instructors currently complete for each client when they hire diving equipment.

DEEPER DIVES Hire Agreement			
Hire Details		Client Details	
Hire Agreement No.	456	Client ID	56
Date of Hire	12/04/2015	Name	Wendy Walker
		Address	10 Sea View Dr
Equipment Product Code	Description	Cost of Hire (£)	
AC2566177777	Air Cylinder	15.00	
RG5365265661	Regulator	15.00	
BW5626526617	Belt and Weights	10.00	
FN3626627177	Fins	7.00	
DS2162617271	Dry suit	30.00	
TOTAL COST (£)		77.00	

Jennifer starts the normalisation process with a representation of the form and its data.

Normalise the data in the following steps, identifying both the primary and foreign keys of each table.

- (a) Transform the data into **first** normal form.

[3]

Examiner Only	
Marks	Remark

- 9 Five tables have been added to the database according to the design specification below.

DIVE	
Field	Data Type
<u>DiveNo</u>	INT
LocationNo	INT
DiveTypeNo	INT
DiveDate	DATE
Depth	INT
InstructorID	INT

LOG	
Field	Data Type
<u>ClientID</u>	INT
<u>DiveNo</u>	INT

INSTRUCTOR	
Field	Data Type
<u>InstructorID</u>	INT
InstructorSurname	VARCHAR(30)
InstructorFirstName	VARCHAR(30)
InstructorTelNo	VARCHAR(15)

LOCATION	
Field.	Data Type
<u>LocationNo</u>	INT
LocationDescription	VARCHAR(15)

DIVE TYPE	
Field	Data Type
<u>DiveTypeNo</u>	INT
DiveTypeDescription	VARCHAR(20)

Write a SQL script to:

- Create the dive table as shown above.

[7]

Examiner Only	
Marks	Remark

- Insert a new dive with the following details:

DiveNo	23
LocationNo	3 (<i>Black Rocks</i>)
DiveTypeNo	5 (<i>Dive with Compass</i>)
DiveDate	Today's Date
Depth	30
InstructorID	6 (<i>Joe Smith</i>)

[4]

Examiner Only	
Marks	Remark

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(Questions continue overleaf)

[12]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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Case Study

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Exam Copy

Deeper Dives

Deeper Dives, a company owned by Darren and Sophie Anderson offers a range of diving courses to the public from three dive centre locations on the North Coast. The company is very successful and has attracted many clients, particularly in the last year.

Darren has overall responsibility for all three centres and operates from an office at the main dive centre. Sophie manages the daily operation of the largest of the dive centres and oversees the work of the other two centre managers, Paul Williams and John Ferguson.

Courses available to the public are at the following levels:

- Sampler:** Theory class and practical session followed by one dive – maximum of five participants;
- Beginners:** Theory class and practical session followed by four dives scheduled over two days where two dives can be completed on each day – maximum of six participants;
- Intermediate:** Theory class and practical session followed by ten dives scheduled over five days where two dives can be completed on each day – maximum of six participants;
- Advanced:** Theory class and practical session followed by ten advanced dives scheduled over five days where two dives can be completed on each day – maximum of six participants;

Sophie, Paul and John review the schedule of courses to be offered every eight weeks. This schedule is intended to ensure that there is coverage of all courses at one or more of the centres each week. It is also intended to ensure the availability of suitable instructors. Sophie records the centre, the course title and the name of the assigned instructor on the correct page in her course diary.

Sophie tries to respond to enquiries received at the three centres as these reflect the demand for a particular type of course. These enquiries are not always recorded properly or communicated effectively as they are frequently verbal exchanges and are often forgotten. Clients are consequently lost or are disappointed that their request for a particular type of course has not been considered.

There are currently twenty suitably qualified instructors. Sophie maintains their records in a file in the filing cabinet in Darren's office. These records include contact details, medical clearance forms, diving certificates and current first aid certificates. When an instructor is assigned to a course, their certification and experience must be thoroughly checked to ensure their suitability for the course on offer. Instructors are issued with a copy of the schedule and are supposed to confirm their availability. Only one instructor is assigned to each scheduled course.

Clients can book any of the scheduled courses. Sometimes they may have to travel to a different centre to attend the required course on their preferred date.

Sophie records all client bookings. This means that clients must either attend the main dive centre or correspond with Sophie by post or e-mail.

When a client books a course, a 10% deposit is taken either in cash or electronically. Sophie records the client name, date of birth, telephone number and emergency contact details beneath the course title in the course diary. Some clients pay the full amount at this stage and Sophie must mark 'Paid' beside their name. This does not always happen and there have been some unpleasant exchanges with clients.

The records in the diary are untidy and difficult to read. This is problematic as the information must be used for a range of purposes including identifying the popularity of each course.

Clients who have made an advance booking get a copy of the schedule with their booking highlighted. Clients, and sometimes instructors, fail to attend on some occasions and must be contacted urgently. This is difficult for Paul and John at the other two centres.

On the first day of a course, client documentation is checked and attendance recorded. Clients are advised that they must provide documentation in keeping with any prerequisites of the course. This could include proof of age, previous certification or medical evidence as necessary. Clients also pay the balance of their payment at this point. If the documentation does not comply with the specified prerequisites, clients will be asked to leave and will have their deposit refunded by Sophie. Paul and John struggle with keeping track of the money received and are often unsure if full payment has been made.

Each instructor has a 'dive diary', in which they must record details of the planned dives, including location, date, time and type of dive. The name, address and telephone number of each client is also recorded for each dive date. Instructors use their dive diary to look over the dive history and to create statistics. Since instructors are responsible for their own dive diaries, Sophie has little or no information regarding what happens on the day.

Instructors are responsible for ensuring that there is adequate equipment available for hire. They are responsible for checking equipment and identifying any items that need repair or are due for testing by an outside contractor in order to fulfil legal requirements. On some occasions, when the stock is checked, there is not enough equipment for the number of people in the group. This can happen when other centres have borrowed equipment and not returned the items, or if repairs have not been carried out on time. This means that the instructor must try to source equipment at one of the other centres and, if unsuccessful, must cancel the dive for that day. Health and Safety is of paramount importance and an instructor using untested or faulty equipment would be dismissed instantly.

When a client hires equipment, the instructor must complete a 'Hire Agreement' form adding the client name, address and the items hired. The cost is totalled by the instructor and payment is made. These forms are poorly completed by the instructors with client details frequently left out. Tracking of hire equipment is therefore extremely difficult.

Clients are given a 'Dive Log' book to record details of their dives. The instructor signs this on completion of each dive. When sufficient dives have been completed for certification, clients must send the Dive Log book to the instructor within twelve months of their initial enrolment. The instructor then advises Sophie to issue a certificate if the client has fulfilled all course requirements. Sometimes clients lose their Dive Log and instructors have to recreate it using dive diaries.

Sophie must work out monthly wages for instructors. This involves going through the course diary and extracting relevant information. The level of course determines the rate of pay. Sophie must work out the number of dives each instructor has supervised using their Dive Diary. Dive diaries in active use are often handed in late, resulting in late payments. All financial information is passed to Darren who manages the Accountancy System.

Each centre has its own stock allocation which may be loaned to other centres. Stock checking should be conducted regularly by managers and borrowed items returned to the correct centre. Missing and defective stock items are notified to Sophie. She will contact the most recent user to request immediate return of missing items. She will also arrange for repairs and periodic tests to be conducted. Keeping track of stock is extremely difficult because of incomplete records.

Darren and Sophie have decided to seek professional advice from the consultancy company, Future Solutions, on the development of a computer based system for Deeper Dives. Future Solutions will conduct a detailed investigation of the current system and will design and develop an agreed solution.

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