TECHNOLOGICAL UNIVERSITY DUBLIN
CITY CAMPUS

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TU856 - BSc. (Honours) Degree in Computer Science
TU857 - BSc. (Honours) Degree in Computer Science (Infrastructure)
TU858 - BSc. (Honours) Degree in Computer Science (International)

Year 3

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SEMESTER 1 EXAMINATIONS 2021/22

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Databases 2

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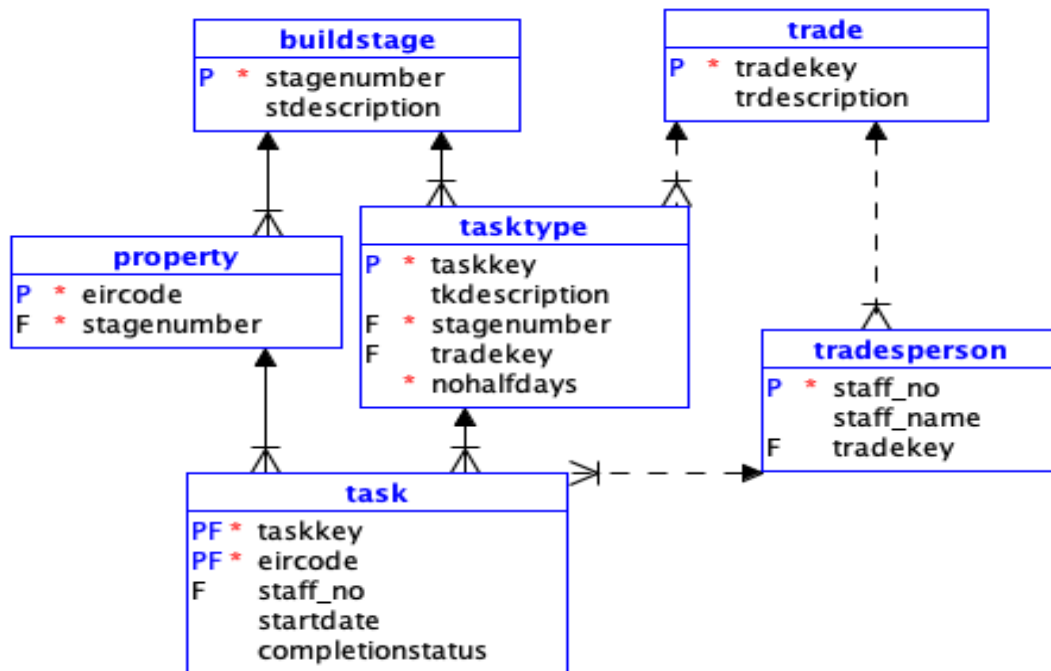
Two Hours
Plus half an hour to upload

Instructions to candidates:

. Please provide solutions using MS Word, Open Document format or PDF. Any drawings should be drawn on paper, photographed, uploaded and included in your submission document.

Please read Case Study 1 carefully before answering any questions.

Please answer question 1 and any two other questions.

There is a syntax sheet at the end of the paper to assist you.

buildstage

P	*	stagenumber
		stdescription

trade

P	*	tradekey
		trdescription

property

P	*	eircode
F	*	stagenumber

tasktype

P	*	taskkey
		tkdescription
F	*	stagenumber
F		tradekey
	*	nohalfdays

tradesperson

P	*	staff_no
		staff_name
F		tradekey

task

PF	*	taskkey
PF	*	eircode
F		staff_no
		startdate
		completionstatus

A property developer builds properties on several different sites. Each property may be at a different stage of development, and each is uniquely defined by its eircode. There is a series of types of tasks (tasktype) that must be done to every property at a given stage and each task type is allocated a number of half days for completion (nohalfdays). In most cases, these tasks require the expertise of a qualified tradesperson, but some do not require a trade. For example, one of the task types has a description (tkdescription) 'Clear all surface rubbish from site', so in this case the tradekey value is null. The trades are defined in the trade table, with a full description (trdescription) and a short key (tradekey). Each task type should take a specific number of half days (nohalfdays) to complete. When a property is deemed to be at a specific stage, a task for each task type in that stage is added to the task table, with a completion status of 'U'. The site manager then updates the tasks, allocating a tradesperson who has the required trade to perform the task on that property. When the task is complete, the tradesperson records the start date and completion status. Before a property's development can move up a stage (e.g. from stage number 1 to stage number 2), all tasks relating to that property that are of a task type for the completed stage must have a status of 'C' for complete.

Case Study 1 Developer and Developments

Question 1 is compulsory

1. Read Case Study 1 Developer and Developments before attempting this question.

    (a) The **construction manager** sets up new properties (property), initially at build
    stage 1 (stagenumber) and the tasks (task) for each stage of the build (buildstage),
    with an initial completion status (completionstatus) of 'U', adding new task types
    (tasktype) if they are not already there. If a new tasktype requires a trade that is not
    recorded, the construction manager adds the trade. The **site manager** is responsible
    for hiring and allocating staff (tradesperson) to tasks, and adds new staff
    (tradesperson) and their trade (tradekey) if they have one. The site manager also
    updates the property stage (stagenumber) when a stage has been completed. The
    trades person who has been allocated to the task updates that task when it is
    completed, changing the completionstatus to 'C'. The **estate agents** can see the list
    of properties and their build stage, but no other details.
    Copy the table below into your examination script and using the information
    described in Case Study 1, fill in the boxes with permissions (S (select), I (insert), U
    (update) that each type of user has over the tables, using the principle of least
    privilege.

	Construction Manager	Site Manager	Trades person	Estate Agent
buildstage				
property				
trade				
tasktype				
task				
tradesperson				

    (6 marks)

    (b) Write queries to do the following:
    (i) Write SQL to list the task description (tkdescription), trade description
    (trdescription) and property address (p_address) for all new tasks
    (completionstatus='U'). **(6 marks**)

    (ii) List the task description (tkdescription) and trade description (trdescription) for
    all task types where no tradesperson with that trade is recorded. **(6 marks)**

    (iii) Write SQL to list each tradesperson and the number of tasks that they have been
    allocated, including trades people who have completed no tasks. **(6 marks)**

    (c) Write a trigger to prevent a property's build stage from being updated if there are any
    incomplete tasks from its current stage for the property. **(16 marks)**

Question 2.   **[30 marks]**

Developer						SORBIN ESTATES.		
Address		Head Office, Main Street, D2.			Phone:	017133222		
Development		**Dunroaman, Dublin 27.**			Desc-ription	*Convenient to Rail and village. Due for completion Summer 2022.*		
Unit	Type	No Bed-rooms	No Bath-rooms	Sale Stage	Agent Id	Agent Name	Office Address	
Apt 1A	1-bed	1	1	Sold	465	Jasper	45 Main Tce, Dublin 1	
Apt 1B	Bijou 1	1	1	Sale Agreed	844	Marie	12 Main Drive, Ongar, D15.	
Apt 1F	Duplex	2	1	Sold	844	Marie	12 Main Drive, Ongar, D15.	
Apt 1K	4-bed Apt	4	2	For Sale	465	Jasper	45 Main Tce, Dublin 1	
Unit	Type	No Bed-rooms	No Bath-rooms	Sale Stage	Agent Id	Agent Name	Office Address	
Development		**Hilltop, Wexford**			Desc-ription	*Idyllic rural setting. Planned Rail connection. Completes Spring 2023.*		
1 Hilltop Ave	5-bed	5	3	For Sale	465	Jasper	45 Main Tce, Dublin 1	
2 Hilltop Ave	5-bed	5	3	For Sale	981	Daire	45 Main Tce, Dublin 1	

Figure 1 Property Development Register

The developer delegates the selling of built properties to agents in different areas around Dublin. Agents do not change their offices, but there can be more than one agent in an office. Each development may have different types of properties, but usually have multiple properties of each type. The unit is the item being sold and each development unit must be unique – i.e. there can only be one Apt1B, Dunroaman, Dublin 27.   You may assume that the developer name is unique, but that there are several developers with property listings in the property development register, such as the one shown in Figure 1.

   (a) Represent the form in Figure 1 in unnormalized form, first normal form, second normal form and third normal form.   **(20 marks)**

   (b) Rename the final forms as entities and draw[1] a fully normalized ERD to represent the entities derived by the normalization properties, showing primary keys, attributes and relationships.   **(10 marks)**

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[1] Please draw this on paper, photograph it and upload the image into your solution document.

Question 3.   **[30 marks]**

Please note: In this question you are not expected to copy the data into your answer book. You should show a design only.

Extra data on each property is kept by the estate agents. Two examples are shown below:

Address Apt 1A, Dunroaman, Dublin 27, the kitchen is north-facing. It is furnished with wooden worktops, a standard sink, chrome finished taps, under the counter fridge, fitted electric hob, fitted electric oven and washer dryer. The walls are painted cream and the floor is covered with linoleum. The bathroom is fitted with a ceramic shower with curtain and a standard toilet and small sink. The walls are painted cream.

Address Apt 1K, Dunroaman, Dublin 27, the kitchen is south-facing. The kitchen has fitted units and a central island. It is furnished with granite worktops, a standard sink, chrome finished taps, a built-in double-height fridge-freezer, a fitted hob, integrated double oven, washing machine, dryer and dishwasher. The wall behind the worktop is tiled and the floor is tiled. There are two bathrooms. Bathroom 1 has a tiled floor and walls, a bath, a toilet, his'n'hers sinks with inbuilt storage. Bathroom 2 has a shower, sink and toilet. The walls are painted cream.

3. (a) Assuming a relational database will be used to hold this data, design a schema of tables that would be suitable to store this data.   **(10 marks)**

  (b) Assuming a MongoDB database will be used to hold this data, design a schema of collections that would be suitable to store this data.   **(10 marks)**

  (c) Compare your designs, stating advantages and disadvantages of each.   **(10 marks)**

Question 4.   **[30 marks]**

4. Write a PL/SQL program, procedure or function to allow the site manager to add a new tradesperson.   For this purpose, assume that the person will have one of the trades in the trade table and that there is an existing sequence called STAFFSEQ that can be used to provide unique values for STAFF_NO. Make allowances for the fact that users may enter incorrect information and use exceptions to display meaningful error messages. On successful completion, display the new staff number, name and trade description.

                                                                                                   (30 marks)

SQL

SELECT column-list FROM tablename
[WHERE condition]
[ORDER BY column-list]
[GROUP BY column-name]
[HAVING condition];
SELECT column-list FROM join-
expression
Join-expression =
    table1 JOIN table2 ON condition |
    USING (column-list)
    table1 LEFT JOIN table2 ON
    condition | USING (column-
    list)
Conditions : =,>,<,>=,<=,<>, BETWEEN
    .. AND.., IN (list), IS NULL,
    LIKE
Logical operators: AND, OR, NOT
Set operations: UNION, INTERSECT,
    MINUS

INSERT INTO tablename [{column-
    name,}] VALUES (data-value-
    list)
UPDATE tablename
[SET column-name= <data-value>]
    [WHERE condition]

PL/SQL_BLOCK

DECLARE
  [constant/variable declarations]
BEGIN
  Executable statements
[EXCEPTION
 exception handlers]
END;

PL/SQL FUNCTION

CREATE OR REPLACE FUNCTION
        <function-name>
        (parameter list)
        RETURN <datatype> AS
  [constant/variable declarations]
BEGIN
  Executable statements
RETURN Return value
[EXCEPTION
 exception handlers]
END;

Exceptions:
DUP_VAL_ON_INDEX
NO_DATA_FOUND
TOO_MANY_ROWS

Error variables:
SQLCODE – gives error code
SQLERRM – gives error message.

MONGODB EXAMPLES

Create a contacts collection:
db.createCollection("contacts",
{ validator:{ $or:[
 {"phone":{$type:"string"}},
 {"email": {$regex: /@mydit\.ie$/}},
 {"status":{$in:["Unknown","Incomplete]}}
 ] }}}

Insert documents, products collection:
db.products.insertMany([
    { item: "pencil", qty: 50, type: "no.2" },
    { item: "pen", qty: 20 },
    { item: "eraser", qty: 25 }
  ])
Attributes may contain embedded
        documents or arrays.

<Embed_attrib_name>:[{set of embedded
        attributes}]