YISHUN JUNIOR COLLEGE
JC 1 SEMESTER EXAMINATION
in preparation for General Certificate of Education Advanced Level
Higher 2

CANDIDATE NAME			
CT GROUP		INDEX NUMBER	

H2 COMPUTING **9597/02**
Paper 2 25 June 2018
1 hour 15 minute

Additional Materials: Answer Paper
Cover Page

READ THESE INSTRUCTIONS FIRST

Write your CT Group, Index Number and Name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.

At the end of the examination, fasten your work securely together.
The number of marks is given in brackets [ ] at the end of each question or question part.

1 The following table shows a partial list of Unicode characters, represented in UTF-16 using hexadecimal.

Unicode	Character	Denary Value	Description
U+03B1	α	945	Greek Small Letter Alpha
U+03B2	β	946	Greek Small Letter Beta
U+03B3	γ	947	Greek Small Letter Gamma
U+03B4	δ	948	Greek Small Letter Delta
U+03B5	ε	949	Greek Small Letter Epsilon
U+03B6	ζ	950	Greek Small Letter Zeta
U+03B7	η	951	Greek Small Letter Eta
U+03B8	θ	952	Greek Small Letter Theta

(a) Explain why the Unicode encoding system has replaced ASCII. [2]

ASCII uses 8 bit and can only represent 2^8 (ie 128) characters, this is insufficient to represent all the characters of different languages. With Unicode, it can represent 2^{16} (ie 65,536) characters with 16 bits and 2^{32} characters with 32 bits.

(b) The Greek capital letter Omega, 'Ω', has denary value 937. Write down its corresponding Unicode. [1]

U+03A9

(c) Write down the 16-bit binary value of the Unicode character ☺ with Unicode U+263A. [1]

0010 0110 0011 1010

2 A training agency offers software skills courses and decides to use a relational database to manage its course schedule. The courses run for 1 to 3 days and have multiple re-runs throughout the year. Each course is delivered by one trainer.

CourseCode	CourseTitle	Level	Duration	CourseDate	TrainerName	PhoneNo
001	Excel	Basic	1	21/07/2018	Susan Wong	97896754
001	Excel	Basic	1	01/05/2018 13/07/2018 11/06/2018	Adam Smith	77564563
002	Excel	Intermediate	2	14/05/2018	Adam Smith	77564563
002	Excel	Intermediate	2	01/05/2018	Susan Wong	97896754
003	Excel	Advanced	3	14/08/2018	Lily Goh	87713341
003	Excel	Advanced	3	14/08/2018	Lily Goh	87713341
004	Access	Basic	1	06/05/2018	Lily Goh	87713341
005	Access	Intermediate	2	Null	Null	Null
006	Access	Advanced	3	27/07/2018	Adam Smith	77564563
007	Word	Basic	1	17/06/2018	Susan Wong	97896754

Table 1: Course schedule

(a) Explain whether **Table 1** is in the first normal form (1NF). [2]

Row 5 and 6 are duplicated. The CourseDate for Row 2 is not atomic.

Table 1 is split into two tables, the `Course` and `Schedule` tables.

CourseCode	CourseTitle	Level	Duration
001	Excel	Basic	1
002	Excel	Intermediate	2
003	Excel	Advanced	3
004	Access	Basic	1
005	Access	Intermediate	2
006	Access	Advanced	3
007	Word	Basic	1
008	Word	Intermediate	2
009	Word	Advanced	3

Table 2 : `Course` Table

CourseCode	CourseDate	TrainerName	PhoneNo
001	21/07/2018	Susan Wong	97896754
001	01/05/2018	Adam Smith	77564563
001	13/07/2018	Adam Smith	77564563
001	11/06/2018	Adam Smith	77564563
002	14/05/2018	Adam Smith	77564563
002	01/05/2018	Susan Wong	97896754
003	14/08/2018	Lily Goh	87713341
004	06/05/2018	Lily Goh	87713341
006	27/07/2018	Adam Smith	77564563
007	17/06/2018	Susan Wong	97896754

Table 3 : `Schedule` Table

A table description can be expressed as:

`TableName (Attribute1, Attribute2, Attribute3, …)`

The primary key is indicated by underlining one or more attributes.

The foreign key is indicated by dotted underlining one or more attributes.

(b) Give a table description for the `Course` table. [1]

Course(CourseCode, CourseTitle, Level, Duration)

(c) Explain why **Table 3** is not in the second normal form (2NF). [1]

Not all non-key attributes are completely functionally dependent on the primary key.

Or, the attribute PhoneNo is dependent on TrainerName and not on the primary key CourseCode.

Table 3 is further split into two tables, the `Schedule` and `Trainer` tables:

CourseCode	CourseDate	TrainerName
001	21/07/2018	Susan Wong
001	01/05/2018	Adam Smith
001	13/07/2018	Adam Smith
001	11/06/2018	Adam Smith
002	14/05/2018	Adam Smith
002	01/05/2018	Susan Wong
003	14/08/2018	Lily Goh
004	06/05/2018	Lily Goh
006	27/07/2018	Adam Smith
007	17/06/2018	Susan Wong

Table 4 : `Schedule` Table

TrainerName	PhoneNo
Susan Wong	97896754
Adam Smith	77564563
Lily Goh	87713341

Table 5 : `Trainer` Table

(d) Explain whether **Table 2**, **4** and **5** are in the third normal form (3NF) and suggest how you will convert it to 3NF. [2]

For Table 2, there is a transitive dependency. Level is dependent on the CourseCode and Duration is dependent on the Level, hence it is not 3NF.

To convert it into 3NF, we split Table 2 into 2 tables :

CourseCode	CourseTitle	Level
001	Excel	Basic
002	Excel	Intermediate
003	Excel	Advanced
004	Access	Basic
005	Access	Intermediate
006	Access	Advanced
007	Word	Basic
008	Word	Intermediate
009	Word	Advanced

Level	Duration
Basic	1
Intermediate	2
Advanced	3

(e) Draw the entity-relationship diagram for this scenario, showing clearly all the attributes, relations, primary and foreign keys. [3]

ER Diagram :

(f) By considering `course` table (**Table 2**) and `schedule` table (**Table 3**), write the SQL query to find the total number of days that Adam Smith is schedule to conduct the training in the year 2018. [2]

SELECT SUM(Duration) from course, schedule WHERE schedule.TrainerName='Adam Smith' AND course.CourseCode = schedule.CourseCode AND schedule.CourseDate BETWEEN '01-01-2018' TO '31-12-2018'

(g) The agency implements the above relational database using a Database Management System (DBMS). It writes programs to access the data using a Graphical User Interface (GUI).

One program is for recording a new course registration.

The firm uses different types of components in a GUI for the display and entry of data.

Name three types of component that the registration form could use and give the types of data it is used to capture. [3]

- Radio Buttons/drop-down list: Limited multiple choice options to choose from, such as the course level Type (with 3 available options), makes input easy
- Text boxes / Text areas: Open-ended input for the students/management to type out names, addresses, and other information that cannot be validated automatically.
- Date-time input functions/areas. Areas of the form that can input dates which can be easily standardised and formatted, allows for automatic computation of costs incurred.

- (other valid answer accepted)

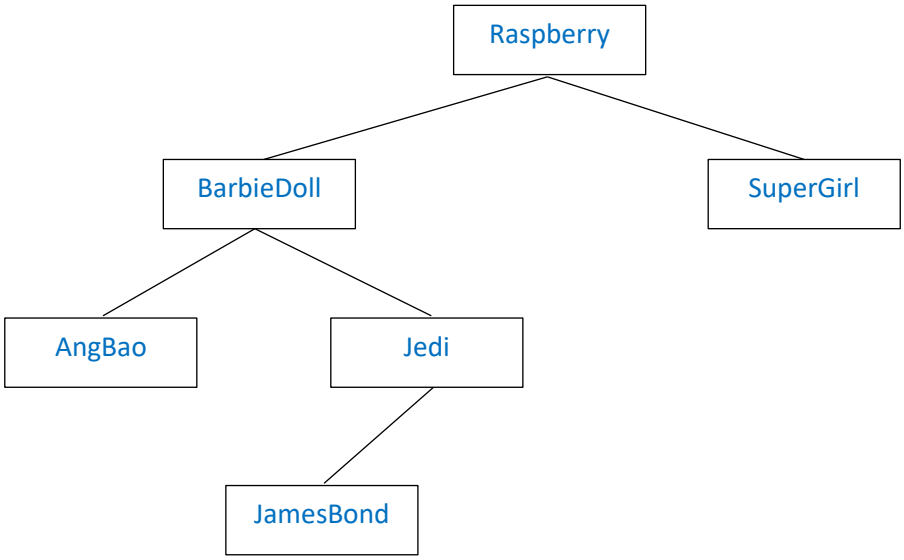
3 When designing an online quiz application, part of the program requires new user to do the following:

- input a User ID
- checks that this User ID has not been used before
- stores the User ID in a binary search tree
- generates the list of User IDs arranged in alphabetical order

(a) The binary search tree that has data inserted in the following order.

Raspberry
BarbieDoll
JamesBond
SuperGirl
Jedi
AngBao

Draw the binary search tree. [4]



(b) **(i)** Using the binary search tree, describe how the program could check that a User ID has not been used. [2]

Perform a linear (binary) search by traversing the tree.

(ii) Using the binary search tree in **part (a)**, describe how the program would provide an alphabetical list of all the User IDs. Include in your description how the result would be obtained from the binary search tree in **part (a)**. [6]

Use a diagram or describe using any six from the following:

- Perform an in-order tree traversal by starting at the root node, **Raspberry**
- Visit each node once by recursively visiting each left sub-tree, starting with **BarbieDoll** then **AngBao**
- Select the node that has is at the end of left sub-tree, **AngBao**
- Select the sub-tree root, **BarbieDoll**
- Move to the right sub-tree and repeat, selecting **JamesBond** then **Jedi**
- Select the sub-root further up the tree and repeat until the root**, Raspberry** is selected
- Repeat using the right sub-tree selecting **SuperGir**l

4 A software development company currently hosts its own email server. The company is considering to replace it with webmail service, using cloud computing.

(a) State two advantages of this change. [2]

- easily accessible from multiple computing devices (desktops, laptops, tablets, smartphones) as webmail is a SaaS (Software as a Service) that only requires users to have Internet access to a cloud service.
- cost efficient in terms of acquisition and maintenance of infrastructural (hardware servers, software, manpower eg system administrator) savings and allows service to scale when company expands
- efficiency of system (hardware and software) upgrades and security patches, ease of setup, no/minimal downtime in maintenance

(b) State one disadvantage of this change. [1]

- security and privacy
- less customizability

The company is also considering other uses of the cloud. These include collaborative activities between employees of the company and also assistance in developing new software.

(c) Describe an example of how employees of the company may use the cloud to work collaboratively. [3]

- type of service (document editing or spreadsheet, presentation) and purpose
- multiple location, different devices, timezone, centralized document
- automatic notification, revision history, ease of sharing with collaborators, different access rights (edit, comment, view), online chat or discussion

(d) Describe how the cloud can be beneficial to the company when developing new software for a client. [4]

- PaaS (Platform as a Service) - define
- enable different developers to collaborate on same code base, efficient version control (commits, pull requests)
- allows for scalability of application due to cloud usage patterns eg on and off, growing fast, unpredictable bursting, predictable bursting
- developers can focus on application and data, blah blah blah