HWA CHONG INSTITUTION
C2 PRELIMINARY EXAMINATION 2018

COMPUTING
Higher 2

18 September 2018 **Paper 2 (9597 / 02)** **0815 -- 1115 hrs**

Answer ***ALL*** questions.
Begin ***EACH QUESTION*** on a ***FRESH SHEET*** of paper.

The maximum mark for this paper is 100.

1. (a) A local area network can be set up as either client-server or peer-to-peer.

(i) State where data are stored on a client-server network and why? [1]

(ii) State where data are stored on a peer-to-peer network and why? [1]

(iii) In your opinion, what is the key benefit of a client-server network over peer-to-peer network. Justify. [2]

(iv) In your opinion, what is the main drawback of a client-server network compared to a peer-to-peer network. Justify. [2]

(b) A 60 Megabyte file is transferred over a network to a printer in 10 seconds.

Calculate the transfer rate, in kilobytes per second, used to transfer this file. Show all of your working. [1 MB = 1024 KB] [2]

(c) Explain how DHCP operates in a network? [3]

(d) Switches and routers are both connecting devices.

(i) What are the purposes of having connecting device in a network? [2]

(ii) What are the differences between them? [2]

2. (a) What are the characteristics of a voice-user interface? [2]

(b) What are the strengths and weaknesses of a voice-user interface in comparison to a graphical user-interface? [4]

(c) One of the 8 golden rules for interface design is the element of consistency.

(i) Explain the importance of consistency in designing a user interface. [4]

(ii) Is consistency still important in the newer user-interfaces (eg. voice, gesture)? Why is this so? [2]

(iii) Voice User interfaces gaining popularity with the readily availablity of devices like Echo and iphone. What do you think are some of the key design elements that are vital to an effective user experience when using such devices? Explain your answers. [3]

3. (a) Explain what is meant by the following terms and give an example for each

(i) Candidate key [2]
(ii) Secondary key [2]
(iii) Foreign key [2]

(b) The school's Robotics club is looking at designing a relational database to keep track of members participation and achievements. Proposed a relational database design for this purpose.

(i) Give the table descriptions in shorthand notations. Explain the purpose of all your tables. Highlight the necessary details needed in your design. [6]

(ii) Draw the entity-relationship model for your design. [3]

4 An apartment block in a city consists of a large number of apartments. Each of the residents of the apartments has their information stored in a file.

The records in the file are to be sorted into alphabetical order of the resident's name.

(a) Using the following list of names as an example, show how the records can be sorted into alphabetical order using an insertion sort.

GRA, CHR, DAV, SAR, TOM, KAT [4]

(b) Residents sometimes make requests for maintenance on their apartments. Each request is given a priority number ranging from 1, for failure of the air conditioning, to 10, for a dripping tap. Each request is stored in a linked list in order of priorities. Jobs with equal priority are stored in order of the date that they have been submitted.

Describe an algorithm to insert a new job into the list. [6]

5. (a) Explain the difference between an iterative solution and a recursive solution to a problem. [2]

(b) The program `RADIX_CONVERT`, listed below, calls a recursive procedure, `OUT`. Note that `x DIV y` gives the integral part of the quotient when `x` is divided by `y`, and `x MOD y` gives the remainder.

```
Program RADIX_CONVERT
   declare integers a, b
   input a, b
   OUT (a, b)
   print a, b
End RADIX_CONVERT

Procedure OUT (x, y)
   declare integers a, b
   a = x DIV y
   b = x MOD y
   if a > 0 then OUT (a, y)
   print (b)
end OUT
```

(i) Draw a diagram to trace the execution of the program, `RADIX_CONVERT` with values 46 and 3 as input for `a` and `b` respectively. Show clearly the order of call and return, and the change in values of `a` and `b`. [4]

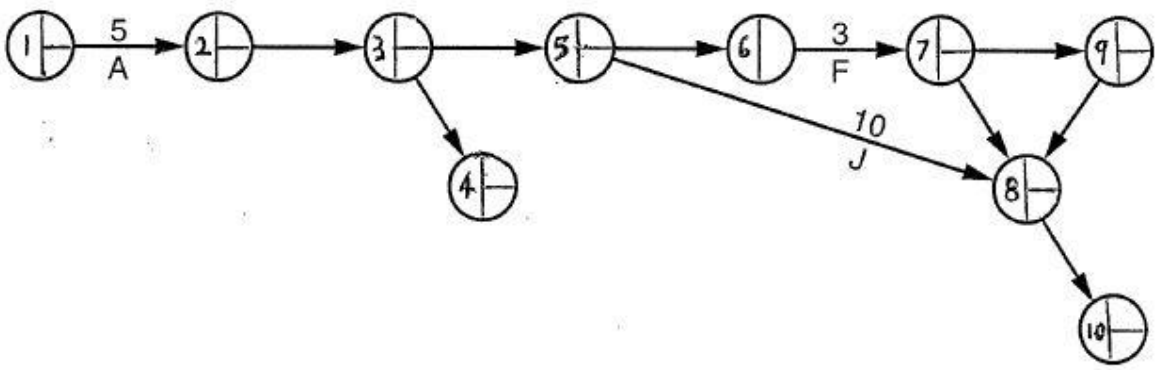
(ii) Write down, in the correct order, all the values printed. [2]

(iii) What does `RADIX_CONVERT` accomplish? [2]

6. Carrie Car, a car accessories shop wants to sell its products through the internet. A software house has been engaged to supply the computerised solution. The project manager has drawn up a list of activities and their likely duration.

Activity	Description	Weeks to complete
A	Write requirement specification	5
B	Produce program design	5
C	Write module code	15
D	Module testing	10
E	Integration testing	5
F	Alpha testing	3
G	Install software and acceptance testing	5
H	Write end user training guide	5
J	Write technical documentation	10
K	End user training	4
L	Sign off final system	1

(a) The project manager decides to construct a Program Evaluation Review Technique (PERT) chart from this data.



(i) Complete the PERT chart. [3]

(ii) State the critical path and elapsed time for this project. [2]

(iii) State the earliest and late start for activity J. [2]

(b) The systems analyst from the team gathered the following requirements:

- A customer can place an order either by telephone or via the internet
- The order will be placed in a file to be dealt with by the warehouse staff
- An email acknowledgement of the order will be sent to the customer
- After completion of the order the customer details will be stored in a customer file

List details of the data stores required, and draw the data flow diagram for the solution. [6]

(c) Various procedures are written. One of the procedures is written to look up the customer record in the customer file. The procedure then adds the value of the current order to the total ordered by the customer this year. This determines whether or not a discount is payable.

Parameters can be passed to a procedure by using pass-by-value or pass-by-reference. Explain the two methods and highlight the difference. Using the scenario above, give an example of each to illustrate the difference. [6]

(d) Besides car accessories, Carrie Car also sells car insurance. Customers can insure their car using one of two methods:

- Method A: by using the Internet or

- Method B: by using the telephone to talk to a sales representative.

(i) For method A, describe how the car registration could be validated. [1]

(ii) For method B, describe how the car registration could be verified. [1]

(iii) Explain the difference between data validation and data verification. [2]

(e) The rules that are used when deciding whether to offer insurance to customers and whether to offer discounts are as follows:

- If the customer has been refused insurance by another company and their car is over 10 years old then insurance is refused.
- If the customer has been refused insurance by another company and their car is not more than 10 years old then insurance without any discount is available.
- If the customer has not been refused insurance by another company and their car is over 10 years old then insurance without any discount is available.
- If the customer has not been refused insurance by another company and their car is less than 10 years old and they have made not more than three claims previously then insurance with a discount is available.

(i) Create a decision table showing all the possible outcomes and results.

(ii) Simplify your decision table by removing redundancies. [7]

7. The elements of an array are numbered 0 to MAX. It is wished to copy all the data items stored in that part of the array between START and FINISH to a different position in the array, the item at START moving to NEWSTART.

Describe in detail an algorithm to accomplish this. You may assume that no items will be moved beyond the range of the array, but remember that the copying may be in either direction, and that the new position may overlap the old. [5]

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