Government of South Australia

SACE Board of SA

Sample External Examination 2011

2011 SAMPLE INFORMATION TECHNOLOGY PAPER

The external assessment requirements of this subject are listed on page 20.

ATTACH SACE REGISTRATION NUMBER LABEL TO THIS BOX

Time: 2 hours

Pages: 20
Questions: 9

Examination material: one 20-page question booklet
one SACE registration number label

Approved dictionaries, notes, and calculators may be used.

Instructions to Students

1. You will have 10 minutes to read the paper. You must not write in your question booklet or use a calculator during this reading time but you may make notes on the scribbling paper provided.

2. This paper is in two parts:

   Part A: Core Topics (Questions 1 to 4)
   Answer ***all*** questions in the spaces provided in this question booklet.

   Part B: Option Topics (Questions 5 to 9)
   Answer ***two*** questions in the spaces provided in this question booklet.

3. The allocation of marks and the suggested allotment of time are as follows:

Part A	70 marks	70 minutes
Part B	50 marks	50 minutes
Total	120 marks	120 minutes

4. Attach your SACE registration number label to the box at the top of this page.

STUDENT'S DECLARATION ON THE USE OF CALCULATORS

By signing the examination attendance roll I declare that:

- my calculators have been cleared of all memory;
- no external storage media are in use on these calculators.

I understand that if I do not comply with the above conditions for the use of calculators I will:

- be in breach of the rules;
- have my results for the examination cancelled or amended;
- be liable to such further penalty, whether by exclusion from future examinations or otherwise, as the SACE Board of South Australia determines.

PART A: CORE TOPICS (Questions 1 to 4)

(70 marks)

*Answer **all** questions in this part in the spaces provided. You should spend about 70 minutes on this part.*

1. When Carlos goes shopping at a supermarket, he purchases items by using a self-serve checkout system. For each item he scans, a price is displayed on the screen. When Carlos has finished scanning all his items, a total is displayed onscreen. He then presses a button to select a payment method.

Source: adapted from Aliencat, Dreamstime.com

(a) From the scenario described above, state an example of each of the five elements found in all information systems.

_____

_____

_____

_____

_____ (5 marks)

(b) (i) Suggest the aim of the information system described in the scenario.

_____

_____ (1 mark)

(ii) State *one* outcome from this information system for the customer, such as that depicted in the image on page 3.

_____

_____ (1 mark)

(iii) State *one* statistical outcome from this information system that could assist in the management of the supermarket.

_____

_____

_____ (1 mark)

(c) Customers are also offered the option of being served by a person at a checkout.

Discuss *one* consequence of the availability of a self-serve checkout system for:

(i) customers.

_____

_____

_____ (2 marks)

(ii) the supermarket management.

_____

_____

_____ (2 marks)

(d) The supermarket advertises different items each week at a reduced price.

(i) Identify *four* pieces of data used by the information system to process these items at a reduced price each week.

_____

_____

_____

_____ (4 marks)

(ii) Identify *one* possible constraint of the information system in relation to people when it processes these items at a reduced price each week.

_____

_____ (1 mark)

(iii) Describe *one* potential problem associated with the constraint you identified in part (d)(ii).

_____

_____ (2 marks)

(iv) Suggest *one* procedure that could be implemented to avoid the problem described in part (d)(iii).

_____

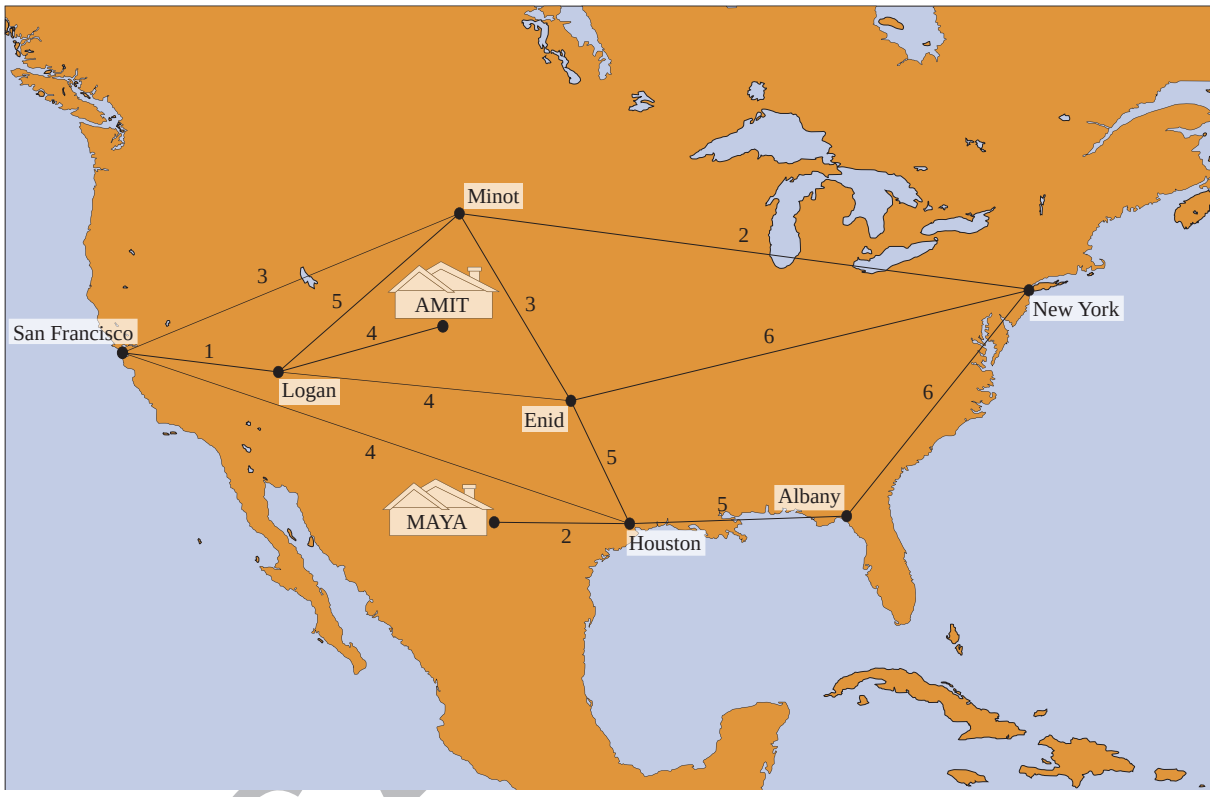
_____ (2 marks)

TOTAL: 21 marks

2. An airline uses a server that is located in New York to process flight bookings. Bookings made by the general public go through the Internet, using various communication connections. The bookings are processed in the order they are received.

   Two customers in different locations, Amit and Maya, are attempting to make separate bookings for the same flight with the airline at the same time. All the possible paths that data packets can take to reach the server in New York are shown in the diagram below.

   The time taken for the data packets to travel along each path is indicated by the number on the path. Each number represents 100 milliseconds.



(a) The paths are constructed from various high-volume transmission media.

(i) Identify the *two* transmission media that can carry the highest volume of data.

(1) _____ (1 mark)

(2) _____ (1 mark)

(ii) Describe how data is transmitted via *each* of the two transmission media you identified in part (a)(i).

(1) _____

_____ (1 mark)

(2) _____

_____ (1 mark)

(b) Explain how Amit and Maya establish connections to the Internet from each of their homes.

_____

_____

_____

_____ (3 marks)

(c) When Amit and Maya both attempt to make a booking, there is only one seat left on the flight.

(i) List the cities that are on the best path the packets must travel at this specific point in time to get from:

(1) Amit to New York.

_____

_____ (2 marks)

(2) Maya to New York.

_____

_____ (2 marks)

(ii) Explain why this path will not always be the best one.

_____

_____

_____ (2 marks)

(iii) With reference to your answer to part (c)(i), state which person will get the last seat available on the flight.

_____ (1 mark)

(iv) (1) State the network hardware device that directs the data packets to the best path.

_____ (1 mark)

(2) Identify the information inside the data packets that the network hardware device uses to direct the data packets.

_____ (1 mark)

(d) Identify the *two* protocols that are necessary in such a data transfer, and explain the key role of each one.

(i) Protocol:_____

Key role: _____

_____ (2 marks)

(ii) Protocol:_____

Key role: _____

_____ (2 marks)

(e) Bookings and purchases of flight tickets need to be made via a secure transmission over the Internet.

(i) State *one* method to ensure secure transmission of data over the Internet.

_____

_____ (1 mark)

(ii) Identify the specific information in this situation that makes the secure transmission of data necessary.

_____

_____

_____ (3 marks)

TOTAL: 24 marks

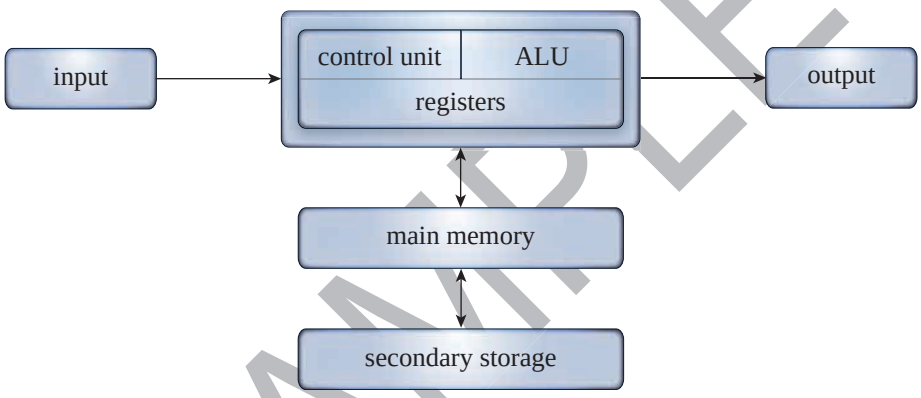
3. A particular car has a trip computer that provides the following information to drivers:
   - the fuel remaining in the tank
   - the distance until the tank is empty
   - the petrol used (in litres) since the trip meter was activated
   - the current rate of fuel consumption in litres per 100 kilometres (L/100 km)
   - the average rate of fuel consumption (L/100 km).

   (a) Identify the *two* data inputs required to calculate the distance until the tank is empty.

   (i) _____ (1 mark)

   (ii) _____ (2 marks)

   (b) The trip computer is an embedded processor. A block diagram of an embedded system is shown below.



   Describe the role of the registers, RAM, and the control unit as the processor determines the distance until the tank is empty.

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____ (6 marks)

(c) Describe the type of memory that would have been used in the trip computer to enable its program to be updated later.

_____

_____

_____

_____ (2 marks)

(d) (i) The trip computer is programmed to warn the driver when the fuel tank is almost empty.

Suggest how the ALU is used to determine this.

_____

_____

_____

_____

_____

_____

_____

_____ (3 marks)

(ii) Suggest *one* method for warning the driver that the fuel tank is almost empty.

_____

_____ (1 mark)

TOTAL: 15 marks

4. Jessie, a keen windsurfer, has an account at a surf shop. To open this account Jessie fills in a form that asked her for information, including personal details. Several months later, Jessie receives an email from an online company advertising its products. She is alarmed to find that the email contains some of her personal information.

   Discuss Jessie's concerns, explaining the general ethical principles of privacy. Her concerns are:

   - Under what conditions can an organisation collect personal information?
   - What is an organisation allowed to do with that information?
   - How can an organisation protect the information it holds from loss, misuse, or unauthorised access?
   - How can she find out where her information has been sent?
   - What can individuals do about removing their information from companies they do not want to have it?

(10 marks)

TOTAL: 10 marks

PART B: OPTION TOPICS (Questions 5 to 9)

(50 marks)

*Choose **two** of the following questions and write your responses in the spaces provided. You should spend about 50 minutes on this part.*

APPLICATION PROGRAMMING

5. *Read the following scenario.*

The Riverdream Caves Tourist Complex uses a custom-made program that assists in the running of tours within the three caves that tourists may visit.

Visitors (mostly families) purchase tickets to the caves, which are referred to by number (i.e. cave 1, cave 2, cave 3).

The following algorithm is the basis of the program used.

```
Constant ticketSingle = 20
Constant ticketFamily = 70

Begin CaveResort
  Initialise
  REPEAT
    ProcessBookings
  UNTIL caveNumber = 0
  CalculateResults
End CaveResort

Begin Initialise
  FOR index = 1 to 3
    caveTotal(index) = 0
  NEXT
End Initialise

Begin ProcessBookings
  READ caveNumber
  IF caveNumber > 0 THEN
    READ numbTickets
    caveTotal(caveNumber) = caveTotal(caveNumber) + numbTickets
  END IF
End ProcessBookings

Begin CalculateResults
  grandTotal = 0
  FOR counter = 1 to 3
    PRINT caveTotal (counter) 'tickets for cave'  counter
    grandTotal = grandTotal + caveTotal(counter)
    PRINT grandTotal 'is the total number of tickets'
  NEXT
End CalculateResults
```

(a) (i) Which variable uses an array structure?

_____ (1 mark)

(ii) State *one* reason why using an array structure makes this algorithm more efficient than if an array structure is not used.

_____

_____

_____ (1 mark)

(b) (i) Desk-check the algorithm using the following test data:

2, 3, 1, 2, 2, 1, 3, 4, 2, 2, 1, 3, 0

`caveNumber`	`numbTickets`	`caveTotal(1)`	`caveTotal(2)`	`caveTotal(3)`	`grandTotal`

(7 marks)

(ii) Show the output resulting from the desk-check.

(2 marks)

(c) Draw a circle around lines in the algorithm on page 12 that comprise an example of each of the following control structures. For each control structure be sure to include all relevant lines in the circle. Write the name of the control structure next to each circle.

(i) Selection.

(ii) Fixed iteration.

(iii) Post-test loop.

(3 marks)

(d) State whether the following variables are global or local.

caveNumber _____

numbTickets _____ (2 marks)

(e) (i) A procedure could be added to the algorithm so that it calculates and prints the charge for the tickets being purchased, using the constant `ticketSingle`.

Complete the following procedure to achieve this.

```
Begin CalculatingCharge
  charge =
  PRINT
End CalculatingCharge
```

(2 marks)

(ii) Draw an arrow on the algorithm on page 12 to show where this procedure should be placed. (1 mark)

(iii) Rewrite this procedure in the space below to allow for a family who purchase four or more tickets to be charged a single entry fee of $70, using the constant `ticketFamily`.

(2 marks)

(f) Discuss how a custom-made program, such as that used by Riverdream Caves Tourist Complex, changes work practices, procedures, and decision-making processes.

(4 marks)

TOTAL: 25 marks

RELATIONAL DATABASES

6. *Read the following scenario.*

Boundini Promotions wants to use a relational database system to keep track of the appearances of models in fashion shows. A fashion show features only one designer and one show is held for each designer on any day. Several models are used for each show.

The following table illustrates some of the data proposed to be stored in the system.

Designer	*Speciality*	*Mobile*	*Date*	*Starting Time*	*Show Venue*
Jackson	Menswear	0415 800 760	Wed 13/1/2010	9.00 a.m.	Luciano House
Linda Chong	Haute couture	0415 988 677	Wed 13/1/2010	11.30 a.m.	Viktor House
Jackson	Menswear	0415 800 760	Tues 6/7/2010	9.00 a.m.	Luciano House
Linda Chong	Haute couture	0415 988 677	Tues 6/7/2010	10.00 a.m.	Viktor House
Jackson	Menswear	0415 800 760	Wed 14/7/2010	9.00 a.m.	Missoni Hotel
Seto	Ready-to-wear	0411 739 467	Wed 14/7/2010	10.00 a.m.	Soprani House
Linda Chong	Haute couture	0415 988 677	Wed 14/7/2010	11.30 a.m.	Missoni Hotel
Zara Gilchrist	Mass market	0411 808 055	Wed 14/7/2010	1.30 p.m.	The Campus

(a) With reference to the principles of normalisation, explain with an example why this data should not be stored in a single table.

_____

_____

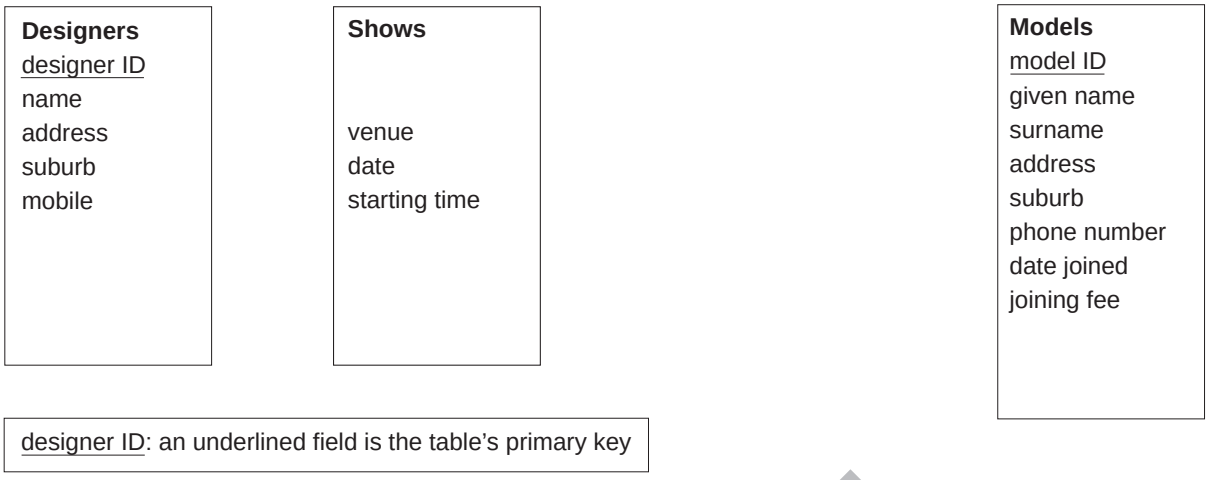
_____

_____

_____

_____ (2 marks)

Three of the four tables needed to store data in this system are shown in the incomplete table relationship diagram below.



(b) (i) In the diagram above, show the relationship between the **Designers** table and the **Shows** table, adding any necessary fields and the appropriate link.

(2 marks)

There is a many-to-many relationship between the **Shows** table and the **Models** table that needs to be resolved.

(ii) Discuss this relationship, explaining why the relationship is many-to-many.

_____

_____

_____

_____ (2 marks)

(iii) Draw the table that resolves the many-to-many relationship.

(1 mark)

(iv) Add fields to store all data appropriately, minimising data redundancy. Complete the table relationship diagram by inserting fields, setting keys, and showing relationships.

(6 marks)

(v) Select fields to be the composite key in the table that resolves the many-to-many relationship. Explain your choice, as to what this key prevents being stored in this system.

_____

_____

_____ (2 marks)

(c) The following additional data needs to be stored in the relational database:

- The standard fee a model charges to appear in shows.
- An indication of whether or not a model has been booked.
- The bonus a designer may pay to the models at a show.

Amend the table relationship diagram to store this data.

(3 marks)

(d) State the most appropriate data type for each of the following fields by completing the table.

Field that stores	*Data Type*
the standard fee a model charges to appear in shows	
the starting time of a show	
an indication of whether or not a model has been booked	

(3 marks)

(e) Discuss the recommendations you would make to assist Boundini Promotions to avoid the loss of data in the management of the relational database.

(4 marks)

TOTAL: 25 marks

OPTION TOPICS 3, 4, AND 5

The final examination paper will contain a question on each option topic.

2011 SAMPLE INFORMATION TECHNOLOGY PAPER

The purpose of this sample paper is to show the structure of the Information Technology examination for 2011 and the style of questions that may be used. The following extract is from the *Information Technology 2011 Subject Outline Stage 1 and Stage 2*:

EXTERNAL ASSESSMENT

Assessment Type 4: Examination (30%)

Students undertake a 2-hour externally set and assessed examination that assesses the core topics and the option topics. The examination consists of short-answer questions and extended-response questions. Students may bring one unfolded A4 sheet (two sides) of handwritten notes to the examination.

For this assessment type, students provide evidence of their learning in relation to the following assessment design criteria:

- knowledge and understanding
- analysis and evaluation.

Source: Information Technology 2011 Subject Outline Stage 1 and Stage 2, p. 87, on SACE website, www.sace.sa.edu.au