JAMES RUSE
AGRICULTURAL HIGH SCHOOL

2009
HIGHER SCHOOL CERTIFICATE
INTERNAL EXAMINATION

Name: *The Perfect Student*	
MARK ALLOCATION: STAFF USE ONLY	
Section A	*20* /20
Section B	*60* /60
Section C	*20* /20
Total mark	***100*** **/100**

Information Processes and Technology

HSC TERM 1 ASSESSMENT TASK SOLUTIONS

General Instructions
- Reading time – 5 minutes
- Working time – 90 minutes
- Write using black or blue pen
- Draw diagrams using pencil
- Mark allocations are provided for each question

Total marks – 100

Section A Pages 2–7

20 marks
- Attempt Questions 1–20
- Allow about 15 minutes for this section

Section B Pages 8–16

60 marks
- Attempt Questions 21–23
- Allow about 60 minutes for this section

Section C Pages 17–21

20 marks
- Attempt either Question 24 or Question 25
- Allow about 15 minutes for this section

SECTION A: ANSWER SHEET

Question 1 to 20: Multiple Choice

Mark the correct box with an X.

QUESTION	A	B	C	D
1				X
2			X	
3				X
4		X		
5	X			
6		X		
7			X	
8				X
9		X		
10	X			
11		X		
12				X
13			X	
14	X			
15		X		
16				X
17			X	
18				X
19			X	
20				X

SECTION A

Multiple Choice

1. Which of the following is a kind of database?

    a. Filing cabinet
    b. Microsoft Access file
    c. Piece of paper
    d. All of the above

2. Which of the following is NOT an advantage of computer-based information systems?

    a. Considerably faster than manual systems
    b. Data can be provided in any order
    c. Less training is required to use them
    d. It is easier to exchange data with others

3. Consider the following database.

Name	**Favourite Fast Food**	**Class**	**Age**
Guy Berryman	McDonald's	11K	17
Will Champion	Pizza Hut	9C	15
Chris Martin	KFC	10A	16
Jonny Buckland	Dominoes	12L	17

"Charlie Lowell, Pizza Hut, 9C, 15" describes:

    a. A field
    b. The key field
    c. A file
    d. A record

4. Which of the following is the best description of an *entity?*

    a. An individual person represented in a database
    b. A specific thing about which an information system collects and processes data
    c. One record in a database
    d. A participant in an information system

5. A company is constructing a hypertext-based prototype for their customer website.

    Which of the following would be most useful in representing the design?
    a. Schematic diagram
    b. System flowchart
    c. Context diagram
    d. Gantt chart

6. A query that finds all licensed drivers, who are younger than 21 years old that have had either a speeding fine or a red light camera offence, would be:

    a. Age < 21 AND Offence = Speeding OR Offence = Red light
    b. Licence = YES AND Age < 21 AND Offence = Speeding OR Offence = Red light
    c. Licence = YES, Age > 21, Offence = Speeding, Offence = Red light
    d. Licence = YES AND Age < 21 AND Offence = Speeding OR Red light

7. In a relational database, a *relationship* indicates:

    a. Fields within a table are related to one another
    b. That a particular field uniquely identifies that record
    c. That two tables share common data
    d. That two tables have identical data

8. Johnny checks his database to make sure that all of his data are within acceptable and appropriate ranges.

    What method of checking is he performing?
    a. Data integrity
    b. Cross-checking
    c. Normalisation
    d. Data validation

Questions 9 and 10 refer to the database below.

Serial Number	First Name	Last Name	Category
33256	Amanda	Smith	Accountant
33123	Joy	Smythe	Receptionist
34589	John	Smithers	Cleaner
33212	Joe	Smithers	Manager
35091	Lola	Sompson	Temporary staff

9. The table is first sorted by the First Name field in ascending order, then by the Last Name field in ascending order. What is the third record after these sorts take place?
    a. Joy Smythe
    b. John Smithers
    c. Amanda Smith
    d. Joe Smithers

10. The following query is performed on the database: **Last Name = Sm*h**

    What result will be displayed?
    a. Smith
    b. Smythe
    c. Smithers
    d. Sompson

11. In a relational database, the rows and columns represent respectively:
    a. Attributes and fields
    b. Records and fields
    c. Fields and records
    d. Attributes and records

12. What is the name given to the device that allows LANs using different protocols to communicate with each other?
    a. Bridge
    b. Router
    c. Hybrid topology
    d. Gateway

13. There are numerous reasons why a company might elect to use a teleconferencing system for its communications. The major reason is:
    a. It is a conceptually simple and therefore cheaper solution
    b. Teleconferencing is just like a face-to-face meeting
    c. It reduces otherwise necessary travel time and increases productivity
    d. It is a high-tech solution that effectively impresses clients

14. A protocol is best described as:
    a. A set of rules that governs the transfer of data between computers
    b. Is an agreed-upon method of error correction on a network
    c. An exchange of information
    d. A set of software and hardware handshakes

15. Any computer network requires nodes, NICs and links (either through cables or a wireless access point). Which of the following network topologies requires more kinds of hardware?
    a. Bus
    b. Star
    c. Ring
    d. Point-to-point

16. Tokens and frames are most likely to be found on which network topology?
    a. Hybrid
    b. Mesh
    c. Star
    d. Ring

17. Which of the following is NOT one of the main aims of a network?

    a. Sharing of documents, data and software
    b. Reducing budget expenditure on redundant hardware
    c. Increasing data security
    d. Communication with others

18. Which of the following processes takes place in a communication system?

    a. Transmitting & Receiving, Storing & Retrieving, Analysing
    b. Display, Analysing, Organising
    c. Processing, Collecting, Storing & Retrieving
    d. All of the above

19. NIC stands for:

    a. Non-Inclusive Characters
    b. Nice Internet Connection
    c. Network Interface Card
    d. Novell Interactive Computer

20. Which of the following is in order from least sophistication to most sophistication?
    a. Router, Hub, Switch
    b. Hub, Router, Switch
    c. Switch, Router, Hub
    d. Hub, Switch, Router

SECTION B

Extended Answer

QUESTION 21 **[20 marks]**

Databases R Us (DRU) is a new company, specialising in the conversion of manually-stored data to electronic-based information systems of varying kinds, according to the needs of its clients. DRU has already attracted a wide variety of customers: corporations without dedicated IT departments; schools with massive amounts of resources stored only on paper; banks with old records that need to be digitised, and even personal clients who seek to have collections of VHS tapes and vinyl records stored electronically and catalogued.

However, since the company is just starting up, both the marketing and technical support departments of DRU comprise of a single person – you.

a. DRU is about to release a new brochure for the company, with the goal of broadening its clientele to include those who are not convinced of the value of electronic databases over non-computer-based methods of storing data. As part of this brochure, describe and contrast the disadvantages of manual data storage methods with the advantages of computer-based databases. **[8]**

- Disadvantages of manual data storage
  - Paper-based records are difficult to manage (physical space required)
  - Can only be sorted according to one criterion at a time; sorting is time-consuming
  - Durability and security issues
  - Difficult to locate specific items (depending on sorting method)
- Advantages of computer-based databases
  - Data can be stored in any order and re-ordered depending on need
  - Data can be accessed faster, especially if there is a large volume of it
  - Data can be accessed remotely
  - Data can be easily shared (and simultaneously accessed)
  - Data can be sorted or processed by computers rather than by people
  - Even if it is physically stolen, encryption can keep data secure

b. A number of potential DRU clients have expressed confusion at the difference between *flat-file* and *relational* databases. To assist clients in choosing between one or the other, explain the unique strengths of each type of database. For each type of database, provide one example of client data that would be appropriate for it and not for its counterpart. **[8]**

- Flat-file databases
  - Simplicity, and ∴ speed.
  - Low file size
  - Versatility (high compatibility)
  - Suitable example
- Relational databases
  - Security and permissions
  - Handles inter-related and complex data
  - Reduce data redundancy (both storage and updating)
  - Multiple access can be handled by a DBMS
  - Suitable example

c. A musician has approached DRU to convert his touring schedule into an electronic database. Previously, he kept records of performance times and locations in his hand-written journal, and his manager rang up radio stations to organise for these times to be publicised and advertised. Now, however, the musician wants the data about his gigs to be widely distributed directly from the database. No processing of his touring schedule is required. **[6]**

What kind of database system would you recommend to the musician? Justify your recommendation with specific reference to the features of the system you choose.

- Most appropriate database system: **hypermedia**
  - Ease of navigation
  - Accessibility – can be distributed online and viewed anywhere with internet
  - Retrieving data requires no training, which is essential for public consumption – avoids need for SQL
  - A full relational database would be too complex for the data required
  - Combination of public/private access through online authentication

QUESTION 22 **[20 marks]**

In response to the recent Victorian bushfires, the Australian federal government has decided to commission the design and implementation of a highly-upgraded communications system specifically the use of national emergency services. The new communications system is to provide a high-bandwidth, country-wide network accessible to all emergency services.

Some of its goals are: to enable rapid responses and relocation of personnel to disaster situations; to ensure accurate communication of vital data and statistics between intra- and inter-state emergency services; to provide assistance to medical staff by expert doctors in remote locations; to facilitate the safe evacuation of people in danger, and to guarantee the transfer of casualties to safety.

a. Give examples of how each of the following are occurring within this particular communications system. **[7]**

Collecting Data about disaster situations is collected by local emergency services, news reporters and locals near the disaster

Organising Data such as video footage, satellite imagery and radio communications must be organised into a form that can be accessed and manipulated by interstate emergency services

Analysing Weather data (e.g. temperature, humidity, winds) can be analysed (e.g. visual representation) in a way that enables emergency services to determine areas of highest fire risk

Storing/Retrieving Data about evacuation procedures can be retrieved by emergency services supervising the movement of locals away from dangerous areas; census reports can be stored and assist in accounting for casualties

Processing Data such as lists of people (e.g. emergency service personnel on active duty, interstate personnel in transit, locals who have been safely evacuated, casualties and their locations) will be constantly updated and processed

Transmitting/Receiving Communication of all aforementioned data between different state emergency services (e.g. fire, ambulance, police) and between interstate administrations

Displaying Emergency command centres that track the various situations in a crisis will have relevant data displayed to alert co-ordinating staff of new developments

b. Due to the important nature of the data that will be circulated by this communications system, error detection and correction is paramount. Outline the *parity check* method of detecting errors and explain why it would not be a sufficiently reliable method in this context. **[4]**

Text

c. One of the major features of the new communications system is a wireless WAN that serves emergency vehicles and allows them to receive real-time data (such as relevant satellite imagery) or transmit real-time data (such as patient status) directly from a field location. Describe the network devices required for such an arrangement. **[4]**

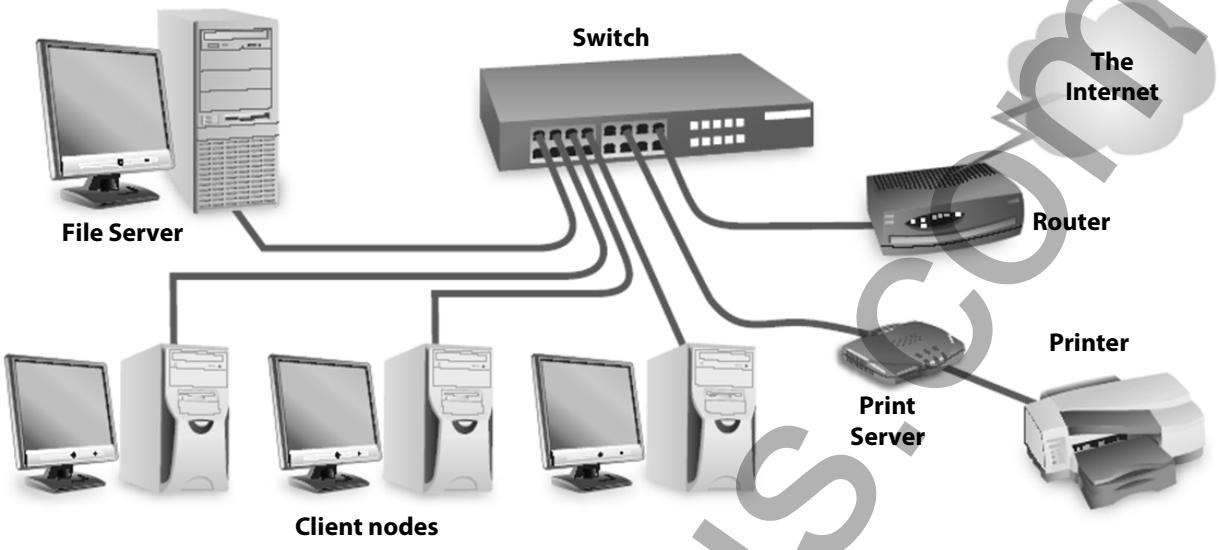
- NICs
- Central server
- Local wireless routers

d. The NSW Fire Brigade is leading the push for all firefighters to have GPS (Global Positioning System) locators implanted on their bodies, so that all firefighters on duty can be accurately located and tracked in real-time, and rescued or brought to safety even if conventional means of communications break down. Other states disagree based on social and ethical grounds. Briefly outline the arguments for and against this initiative. **[5]**

- Benefits
    - Effectiveness in rescuing stranded firefighters
    - Added redundancy for locating firefighters
- Drawbacks
    - Abuse of system during time when firefighters are not on active duty
    - Not all personnel might want to participate in the implantation program

QUESTION 23 **[20 marks]**

The diagram below depicts the network being run in a small office.



a. Describe the topology of this network, and outline some of the weaknesses that characterise this topology. **[3]**

- Star network
  - If the central switch fails, client nodes cannot print, browse the internet or access their files; they are virtually crippled
  - Requirement of significantly increased amounts of cabling depending on physical arrangement and location of switch and nodes

b. A person logged onto one of the client nodes edits one of their documents on the file server, saves it and then attaches it to an email using a *www.gmail.com* account. This email is sent to a colleague's address. The colleague opens the email, downloads the attachment, and sends a copy of the document to be printed. **[6]**

Draw a data flow diagram below that clearly shows ALL the steps that the data took during the procedure described above.

c. In the network diagram provided, the internet is represented by a cloud. "Cloud Computing" is a term that refers to the increasing trend of personal and business users using internet-based network services for their information processing and storage needs. Some experts predict that in the near future, all the data and applications we use on a daily basis will be stored somewhere "in the cloud" rather than on a hard drive in our home computer. **[7]**

Evaluate the effects of this trend on the network outlined above, demonstrating with examples of particular advantages or disadvantages.

- Advantages
  - Less local storage required (file server can be rendered redundant)
  - Less local processing power required
  - Less software/hardware upgrades (which has associated monetary cost, as well as network downtime)
  - Accessibility to identical applications and data outside of the network
  - Ease of sharing with others outside the network
- Disadvantages
  - Reliability on external entity/company for basic functions
  - Privacy/security concerns with internal data passing outside the network on a frequent basis
  - Greatly increased network traffic through internet router
  - Speed of basic processes is subject to internet and network bandwidth

d. What does CSMA/CD stand for? **[1]**

Carrier Sense Multiple Access / Collision Detection

e. Describe how CSMA/CD would function to ensure the reliable transmitting and receiving of data in the network. **[3]**

SECTION C

Extended Answer

Attempt either Question 24 or 25

QUESTION 24 **[20 marks]**

Due to their importance in decision-making processes, databases can often be the sources of significant social and ethical issues.

Parramatta City Council maintains a relational database of all the individuals who come under its jurisdiction in one way or another. This includes all people who live, work or study within the surrounding area. The database contains fields such as age, ethnicity, home address, household income, occupation, marital status, and many more.

a. Describe the problems that might arise if the council's database was incomplete or inaccurate. **[5]**

Problems

- Incomplete data would lead to invalid analysis, wrong conclusions and poor decisions with regard to the community
- Incorrect address
    - Locals might miss mail notifications
    - Confidential data might be sent to wrong recipients
- Incorrect financial payments distributed based on inaccurate income records
- Council might make decisions that cater for an incorrect demographic (e.g. building a skateboard park in a retirement village; e.g. "Sixty year olds? I thought you said 'the place is full of *sixteen* year olds!'"

b. Several community groups have raised concerns regarding the privacy of personal data stored in the council database. Outline two ways that such data could be misused, and justify why the council should still be able to hold such data within their database. **[6]**

- Data misuse
    - Addresses could be sold to commercial organisations and exploited
    - Locals opposing council initiatives could be targeted and abused
    - Unsolicited dissemination of confidential data into the public domain
- Justification: sensitive data must be held by the council because it is essential for them to do their job effectively and efficiently.

c. When the national census is issued, results are collected and the council's database is updated extensively. This vast amount of data must be analysed and displayed in a way that is useful for those attempting to read it. Choose ONE of the following and describe the information that could be derived from using it: (i) query, (ii) sort, (iii) report, (iv) form view. **[3]**

- Query
  - Relationships between particular fields in the database can be elucidated
- Sort
  - Age groups with the greatest income or expenditure can be identified
- Report
  - Statistics can be produced and presented to end users or administrative staff who have no knowledge of how the database functions
- Form view
  - Data about individual entities in the database can be viewed together easily without the clutter of data from other locals

d. Data validation and verification are enormously important processes in an official database like the council's. Describe measures the council could take to ensure that the *address details* stored in their database are (i) valid and (ii) accurate. **[6]**

- Validation
  - Forcing double entry of data
  - Use of a data dictionary to force input of certain data type
  - Range check
- Verification
  - Frequent polling to check accuracy of details (e.g. when logging onto community internet portal)
  - Contacting locals using details in database and requiring response (thus allowing incorrect entries to be removed) or update of details (to make sure potentially incorrect entries are edited)
  - Cross checking data with other organisations that might hold the same data

QUESTION 25 **[20 marks]**

The global internet used today had its roots in the ARPANET (Advanced Research Projects Agency Network), which was developed by the United States Department of Defense. The basic ideas, systems and protocols underpinning the system were invented then, and many persist to this day. However, communications systems like the internet have given rise to social and ethical issues that the original designers never even imagined.

a. Describe the principal benefits and drawbacks that have come about through the widespread use of the internet for communications. **[5]**

- Benefits
  - Speed and breadth of communications
  - Convenience; many services can now be reached at home with a few clicks of a mouse via the internet
  - Price of worldwide communications greatly reduced
  - Expansion of business, commerce and international trade
- Drawbacks
  - Privacy and security of data
  - New forms of crime and fraud
  - Impersonal communications

b. Discuss the changes that have occurred with regard to employment in the banking sector as a direct result of the rise of effective electronic communications systems. **[5]**

- Replacement of tellers at bank branches
- Proliferation of electronic methods for transacting (ATM, phone banking, online account management), and hence the expansion of bank IT departments
- Increase in outsourcing (particularly to offshore locations, e.g. call centres where cost of living and overhead is kept low, so profit margins are higher)
- Less data entry operators (end users have become participants inputting data directly into the banking information system)

c. Internet filtering is a daily and legal reality for the vast majority of countries, not just computers operating within the DET network. Certain websites are blocked or allowed based on the content that they are displaying. Assess the value of widespread internet censorship, making reference to its effectiveness (or lack thereof) and to the paradoxical nature of attempting to control a fundamentally uncontrolled environment such as the internet. **[5]**

- Widespread internet censorship is generally fiercely fought against; workarounds are found and filtering is thus ineffective
- The success of the internet lies fundamentally in its uncontrolled, enterprising nature

- Censorship laws are usually national, but the internet is essentially international
- Legitimate and helpful sources of information are often mistakenly blocked
- Measures of censorship are successful in guarding younger viewers from age-inappropriate material

d. Monetary transactions now occur frequently over the internet. Outline the advantages and disadvantages of being able to manipulate money electronically, rather than being forced to resort to physical means in order to transfer money. **[5]**

Advantages

- Time efficiency
- Can transact and trade with people that would otherwise be impossible to interact with (e.g. overseas)
- Businesses can track customer data and analyse trends more effectively (as opposed to simple cash transactions)
- Conventional theft (i.e. physical) is less effective, as credit cards can simply be cancelled and become useless in the hands of a thief
- No need to access banks or stores physically
- Products can be ordered at any time (24 hours a day, 7 days a week) and processed by human beings at a time convenient to staff

Disadvantages

- Fraud is made much easier
- It is easier to fall into debt (with cash, you can't spend money you don't have; with credit, it is a very straightforward and easy process!)
- Personal information is attached to every transaction that occurs (as opposed to simple cash transactions; this is the flipside of the third point above)
- Reliance on functioning EFTPOS systems (as people might no longer carry large amounts of cash around anymore; I have been caught in a shopping centre with no working EFTPOS due to a problem with telegraph poles in the area, and I had no cash to pay for my grocery shopping!)
- Ease of incorrect charges (e.g. customers can be double-charged or charged a completely different amount if a store clerk inputs incorrect data and the customer does not check what they are signing)

- END OF EXAM -