

Marking Criteria

Section I (20 marks)

Question	Correct Response
1	B
2	C
3	C
4	D
5	B
6	D
7	B
8	A
9	A
10	C

Question	Correct Response
11	B
12	A
13	D
14	D
15	A
16	A
17	C
18	B
19	B
20	A

SECTION II

Question 21 (9 marks)

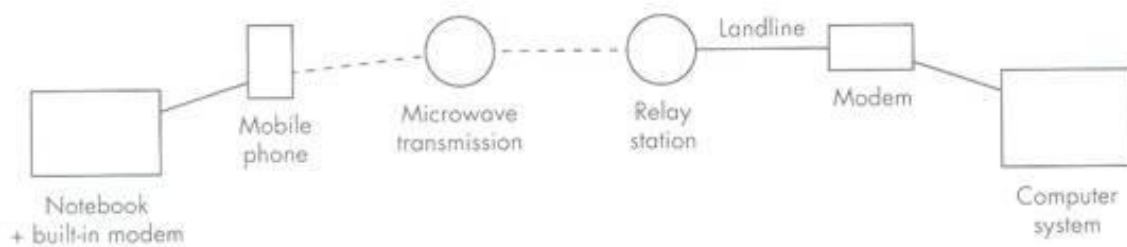
(a) (2 marks)

The sales representative connects to the Internet via a mobile phone. The notebook computer is fitted with a modem, which connects to a mobile phone. In Australia, the mobile phone uses either of the two systems, Global System for Mobile communications (GSM) or Code Division Multiple Access (CDMA).

(b) (3 marks)

The information technology required to support communications would be:

- a notebook computer and modem
- a mobile phone
- mobile phone transmitters or relay stations
- landline, either dedicated or through public switched network (PSN)
- a computer connected to a modem at the *On the GO* headquarters.



(c) (4 marks)

The answer will need to consider the following:

- the type of technical and process changes employees will need to deal with
- the change in work practices that will occur
- how these changes will affect employees financially and within the work environment
- whether this work change is likely to cause additional stress

The information technology used by *On the GO* cosmetics would, in effect, make the *On the GO* sales representatives' offices mobile. All searches or orders would be lodged over the Internet from wherever they are, as long as they were within range of a mobile communications relay station.

The working conditions for the sales representatives might not be comfortable, as the office would know where each of them was at any one time. Their working office space would most probably be their car or client's office.

Question 22 (13 marks)

(a) (4 marks)

Advantages of the computerised information system are:

- The chemist has a printed script, eliminating dispensing errors due to misinterpretation of the doctor's handwriting.
- Doctors sharing a practice may have instant access to each other's patients' records. This would allow doctors to take time for professional conferences, study and other matters, knowing that their patients would not be disadvantaged.
- A doctor could have instant electronic access to specialist diagnostic providers and the text, pictorial and analytical results for a patient.
- Medical staff can communicate via e-mail, allowing messages to be sent without disrupting doctor-patient consultations.

Disadvantages of the computerised system are:

- Doctors and receptionists would have to develop or update their computer skills. Some may be intimidated by computer technology and refuse to use it.
- Setting up the system involves financial costs, which may add to the pressures involved in running a medical practice.
- If all doctors in the practice can access each patient's records, then the risk of security breaches increases. If a doctor leaves his or her office unattended with a login still valid, any intruder could have unrestricted access.
- If remote access is available, hackers may obtain the password and gain unauthorised entry to all confidential patient records.

(b) (3 marks)

The technology required to run the network within the medical practice would be as follows:

- A computer terminal station on each doctor's desk and an appropriate number of terminals for the receptionists.
- A network operating system that would link terminals to each other so that communications could occur between them. The communications would operate through a centralised server or servers, or via a 'peer to peer' network.
- A physical link connecting all the terminal computers. This link may consist of a cable link, or a wireless link, or a hybrid of the two., The cable link could be by twisted pair, fibre optic or coaxial cable.
- A secure encrypted network link would need to be established between the medical practice and medical diagnosis providers.
- Hubs or switches would be used to relay communication traffic between the various file servers and terminals.
- For the Internet link, the connection would probably come through one computer and then be passed on to each of the other linked terminals. The software used for the Internet communications would be the browser software.
- The internet connection would be through a single modem connection, but for constant access and faster speed of access to information, a broadband cable or ADSL may be used. The internet service set up for a medical practice may also be part of a larger intranet service, operating behind a professional firewall to thwart any outside hacking and secure the privacy of the medical data.

(c) (6 marks)

This part requires an analysis or account of the uses and different requirements each of these two groups have of the available information technology. The two screen shots would contain screens either requesting or displaying different information for the two user groups.

Doctors would be interested in the medical history and diagnosis of patients. The screens to which doctors should have access would be those showing medical facts about the patient. Doctors would also require access to certain diagnostic medical services.

The receptionists would be dealing with appointment times for the patients and would be matching patients' desired appointment times with spare consulting time slots with the doctor requested. If the patient's doctor is booked up, the patient would then be offered another time slot, or if no suitable time slots were available with the preferred doctor, then another slot with another doctor in the practice may be suggested.

Receptionists would also be expected to have access to limited financial data such as payments made by patients and Medicare for medical services rendered. Some receptionists would also be responsible of the financial outgoings of the practice, such as rent, energy, council rates, water and building maintenance charges.

The left hand screen shot shown is more appropriate for a doctor and the right hand screen shot is more appropriate for the medical receptionist keeping track of appointment details.

PATIENT HISTORY	
Medicare No.: 2120 77777	
Name: HUNKING Ashley	
DOB: 23/12/1983	
Blood pressure	
30/11/1999	150/120
30/01/2000	120/98
15/05/2002	100/80
Prescription	
30/11/1999	Natrilix 1 tablet / am
30/1/2000	Natrilix 1 tablet / am
15/05/2002	Cease treatment — trial

Example of a doctor's screen view

APPOINTMENTS SCHEDULE			
For 15 August 2003			
Dr Stamelatos		Dr Panagiota	
	Fee		Fee
8:00 a.m.		8:00 a.m.	
Kapelan D.	N	Ruschin P.	N
8:30 a.m.		8:30 a.m.	
Kokkolis M.	Y		
9:00 a.m.		9:00 a.m.	
Chen J.	Y	Hunking A.	N

Y = Fee N = Medicare

PgUp for Previous Page
PdDn for Next Page

Example of a receptionist's screen view

Question 23 (10 marks)

(a)

Correctly identifies an example of data redundancy and is able to justify why it is.	2
Identifies an example of data redundancy OR defines what redundant data is.	1

Data redundancies in the table Sales include:

- The Price field is a duplicate. It's an attribute not needed as it is functionally dependent on the ProductName.
- CustomerPhone is a duplicate. It's functionally dependent on CustomerName

(b)

Demonstrates excellent understanding of the problems of data redundancy as the affect the processes of collecting, processing, analysing and storing and retrieving.	4
Demonstrates a good understand of the problems of data redundancy that relate to information processes of collecting, processing, analysing and storing and retrieving.	3
Demonstrates a good understanding of the problems of data redundancy in general, and as they relate to some processes.	2
Demonstrates limited understanding of the problems of data redundancy.	1

Problems associated with data redundancy in a relational database include:

- **Collecting:**
When gathering information,
 - Extra data needs to be inserted along with the data that actually needs to be inserted.
 - Data that already exists needs to be re-entered along with the new data. E.g. every time a customer buys a new item, the customer's details as well as the product's name and price must be re-entered.
- **Processing:**
When manipulating data by editing and updating it,
 - UPDATE anomalies may occur. It's when changing a specific data item requires the same change in many places. E.g. if a customer changes their phone number, then every record of their transactions needs to be changed.
- **Analysing:**
When transforming data into information,
 - Because details of a product's, employee's or customer's name are entered multiple times, there can be chance that they have been misspelled. They may be overlooked in queries and searches of the database. The information retrieved may not be accurate because the original data itself was not accurate.
- **Storing and Retrieving:**
When saving, reloading and maintain the data,
 - Storing the same data many times requires extra storage space. This affects the speed at which the data is moved. DBMSs deal at the record level – they save, reload, transmit and receive complete records not individual fields. Moving longer records is going to take longer than moving shorter records.

(c)

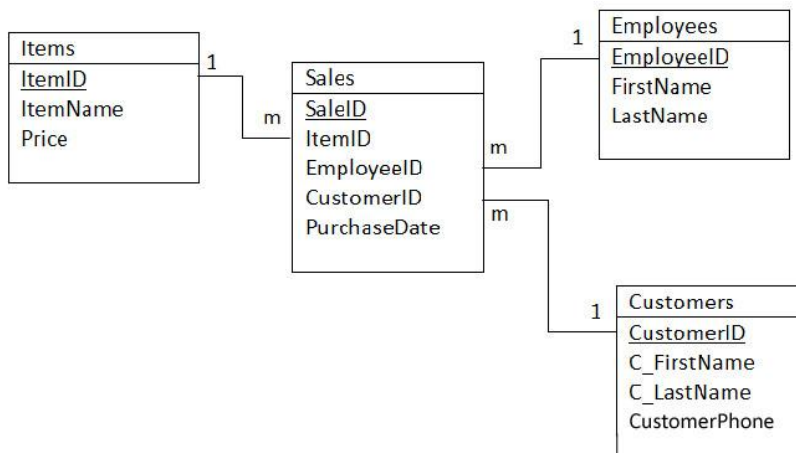
Correctly normalises database into FOUR tables, indicating their fields, primary keys, foreign keys, relationships, and the nature of relationships.	4
Normalises the database into FOUR tables, including primary keys and relationships.	3
Normalises the database into FOUR tables and includes primary keys.	2
Normalises the database into FOUR tables with only the fields indicated in the original Sales table.	1

- In a normalized database, every non-key attribute should be functionally dependent on the primary key only.
- The answer should indicate the creation of primary keys 'CustomerID', 'Employee ID', 'ItemID' and 'SalesID'.
- In terms of the fields with 'Names' e.g. 'CustomerName', these should be split into two fields 'FirstName' and 'LastName' to optimize querying capabilities.

The normalized database should be shown in the form of a schema. The schema should include the following:

- Four tables: Items, Sales, Customers and Employees
- The relationships are and their nature (ie 1 to 1; 1 to m) are shown
- The primary keys are indicated by being underlined.
- Foreign key indicated.
- All fields are shown.

Suggested solution:



Question 24 (10 marks)

(a) (i)

Identifies hardware, software AND communication technology used by the system.	3
Identifies the info technology under two of the headings of hardware, software and communication.	2
Identifies hardware OR software OR communication technology used by the system.	1

Information technology required by a videoconferencing system includes:

Hardware:

- Personal computer for both parties
- A monitor for both parties for displaying video of participants
- Web camera
- Microphone for voice input
- Speakers for voice output
- (Alternative to microphone and speakers is a headset)

Software:

- Web browser
- Video Conferencing software

Communication:

- Broadband Internet connection
- Conferencing management server to used control the setup and running of the conference
- Chat and video server receives video and chat data from all participants and transmits the data out as required.
- Telephone conference server that connects the PSTN lines from both participants into a shared circuit.

(a) (ii)

Demonstrates excellent understanding of the advantages and disadvantages of video conferencing system.	4
Demonstrates good understanding of the advantages and disadvantages of video conferencing systems.	3
Identifies only advantages OR only disadvantages OR only one advantage and one disadvantage of video conferencing systems.	2
Identifies one advantage OR one disadvantage of video conferencing systems.	1

Advantages for the videoconferencing system include:

- The provision for face-to-face communication, allowing for the transfer of body language and facial expressions which improves communication of messages. Also allows for the development of better interpersonal relationships.
- Reduction in costs associated with travel and accommodation.
- The brothers do not have to sacrifice their professional duties to be able to communicate.
- Allows for conversation to happen in real time.

Disadvantages:

- Both parties would be using their home telephone for the conference. This means for the duration of the conference, the phone is unavailable for others to use.
- May require IT specialist to set up the connections
- Low speed Internet connection may compromise the quality of the video

(b) (i)

Articulates clearly and correctly the role of the email client, the mail servers, and client-server operations in email.	3
Discusses the roles of the email client and mail servers	2
Describes the roles of clients and servers, and client-server operations generally.	1

Email uses two different application / presentation layer protocols SMTP and either POP or IMAP.

These protocols run on a single or separate mail server machines. The mail server provides e-mail facilities, stores incoming messages ready for distribution to users and forwards outgoing mail to appropriate devices. It often also has virus and spam protection software installed.

Email client applications, such as Microsoft Outlook, act as a user interface. It is from here the user compiles the email message to be sent, as well as viewing received email messages.

Email client applications communicate with the mail servers using the SMTP, and POP or IMAP protocols:

- SMTP (Simple Mail Transfer Protocol) is used to send email messages from an email SMTP client application to an SMTP server.
- Emails are received by an email client application from a POP (Post Office Protocol) server or IMAP (Internet Message Access Protocol) server.

SECTION III

Question 25 (10 marks): Transaction Processing Systems

(a) (4 marks)

Define batch file and real-time processing and explain how each operates. Give at least one example of each.

In real-time processing, the transaction is carried out at the time the request is received. For example, a service officer enters a search for a customer's name to retrieve the customer's account number or ID. The system then carries out the search until it returns a result. The result could be one or more possible records, or none. Another example of real-time processing occurs when a wager is placed with the TAB. The customer fills out a card with his or her selections and the amount of the wager. The card reader inputs the details and the details are then transmitted to a central computer, which processes the transaction, adds the wager amount to the total pool of wagers and calculates the win and place dividends if it is a collecting wager. In real-time processing, each transaction is unique. Each transaction occurs by itself. In batch file processing, the transactions are not carried out in real time (one at a time), but are collected and processed at a later time or date. Generally, batch file processing is performed when computer power is reserved for important real-time processing, allowing the less urgent tasks to be delayed and batched together for processing when demand for immediate computing power was low. It is a bit like off-peak water heating or off-peak file processing.

(b) (6 marks)

Explain how each issue may affect the transaction outcomes and also explain what is required for each of the issues to be ensured.

Points to be covered:

Data accuracy: data bias, data validation (range checks)

Data security: data sources, encryption, firewalls, secured communication lines

Data integrity: ACID (atomicity, consistency, isolation, durability).

Data accuracy means just what it says: the accuracy of the data. There are ways we can minimise the probability of data being inaccurate. Data bias must be eliminated. The presentation of data needs to be free from bias. Data validation can limit the errors. Data validation means that the data type is checked, so for example if a 'D' is entered in a numerical field, the system rejects that entry. The data input can also be matched against a range check, list check, data type check, a check digit representing a parity bit, or some calculated checksum. While this is no guarantee against data error, it does reduce the risk of an error occurring.

Data security is essential to information systems. Data needs to be secure so that when it is transmitted, it cannot be altered in any way, either accidentally or intentionally. Data also needs to be secure to ensure that personal or otherwise confidential information cannot be received or accessed by unauthorised persons. Data may be transmitted along secure data lines. Transmitted data such as password and other sensitive information could be encrypted to minimise the risk of being intercepted by non-authorised parties. Firewalls may be set up to prevent unauthorised access to secure and internal networks by unwanted intruder software agents.

Data integrity in real time transaction processing is demonstrated when the transaction passes the ACID test. Data may not be reliable due to transaction processing errors.

Question 26 (20 marks): Multimedia Systems

a)

Demonstrates excellent understanding of run-length encoding	2
Demonstrates limited understanding of run-length encoding	1

In defining run-length encoding, must mention:

- It is a method of compression
- Repeating patterns within the binary data are sought out
- Stores the pattern once as well as the number times it's defined

b) (i)

Describes at least 4 relevant issues relevant to image inclusion in a multimedia presentation	4
Describes 3 relevant issues relevant to image inclusion in a multimedia presentation	3
Describes 2 relevant issues relevant to image inclusion in a multimedia presentation	2
Describes 1 relevant issue relevant to image inclusion in a multimedia presentation	1

Issues include:

- **Copyright** – does that image have copyright? Do you need to ask permission to use it in the presentation? When you are preparing images, you need to make sure you don't infringe any copyright laws. Whether the presentation is for public or personal use.
- **Image quality** – ensure the image is not noticeably pixelated on screen
- **Resolution of user's display** – image should be scaled to size of end user's display. This influences file size.
- **File format** – presentation software needs to be compatible with that image format.
- **Speed of connection** – if presentation is viewed from internet, need to keep the file sizes not too large. It'll take too long to download.
- **File size** – if the file is too large, then it may cause the multimedia presentation to lag.
Compression – which method of compression will reduce the files to reasonable size, yet retain enough quality for presentation method?

(b) (ii)

Demonstrates a comprehensive understanding of the features of graphic software. Names an example of graphic software.	3
Demonstrates a good understanding of the features of graphic software. Names an example of graphic software.	2
Demonstrates a limited understanding of the features of graphic software. Names an example of graphic software.	1

Major features of graphics software include:

- Manipulates bitmapped images.
- Rotates, crops, resizes and distorts graphics images.
- Can save the photograph in variety of different formats, e.g. JPEG, TIFF, BMP, GIF, PNG
- Works with layers to control individual parts of an image.
- Uses a range of freehand paint and vector tools, including text.
- Manipulates a colour palette and colour gradients
- Applies a range of effects to whole images and selected regions, using textures, patterns and masks.
- Adjusts the brightness, colour and contrast of a digital image.

Examples of graphic software include:

- Adobe Photoshop
- Paint Shop Pro
- Paint

c)

Demonstrates excellent understanding of the hardware used and its operation and processing of image data occurring as an image is scanned from a flatbed scanner and displayed on an LCD screen through graphic software.	5
Describes most of the hardware used and its operation, and the processing of the image data.	4
Describes most of the hardware used and its operation and mentions the analogue/digital processing occurring.	3
Identifies hardware used and mentions analogue/digital processing occurring.	
Identifies hardware used OR mentions analogue/digital processing occurring.	1-2

A flatbed scanner collects reflected light as raw data and converts it to binary digital data. There is a light source in the scanner. Light is reflected off the image. It measures the amount of light reflected back to the light sensor, called a photocell. The light is converted into an electrical current.

The amount of electric current it produces depends on how much light it is receiving. The lighter the colours in the image, the more light is reflected back. The current is converted to digital data by ADC (Analogue to digital converter). It is stored in the buffer memory of scanner device. Some scanners may compress the raw RGB image using embedded firmware.

Then, via an interface cable, commonly USB, the image data is retrieved to the computer's RAM. The image data is retrieved from the RAM by the graphic editing application. There is a video card in the system which translates the data into a form that can be understood and displayed on the screen. The data for the image is converted to an electrical current and transferred to the liquid crystals of the LCD monitor. The electric current is what varies the colours of the pixels. Each liquid crystal corresponds to a pixel of an image. Thus, an electrical current is fired at every liquid crystal on the screen, and the image is displayed.

d)i)

Identifies and describes at least 3 technological advancements that have improved the experience of streaming and listening to audio files	3
Identifies and describes 2 technological advancements that have improved streaming	2
Identifies and describes technological advancements in general	1

Advances in technology that have improved the streaming of and listening to of audio files includes:

- Improved bandwidth allows for faster download and delivery to local computer, and allows transmission of higher quality sound file
- Improved resolution of microphones records higher sound quality
- Improved quality of display of sound files
- Increased storage capacity – allows sound files of larger size to be stored, which can mean higher quality
- New codecs for handling compression of media, while improving quality of compression

(d) (ii)

Correctly calculates the size of the audio file and clearly indicates all the components of the calculation	3
Correctly calculates the size of the audio file and describes some of the components of the calculation	2
Shows the calculation needed to find the size of the audio file.	1

- 44100 is the number of samples per second
- 16 is the bit depth of each sample
- 120 seconds is how long the audio file is
- Multiply together to get total size of file in bits (44100 X 16 X 120)
- Divide the total by 8 to get the answer in bytes
- Divide again by 1024 to get the answer in kilobytes
- Divide again further by 1024 to get the answer in megabytes.

$$\frac{44100 \text{ samples} \times 16 \text{ bits} \times 120 \text{ seconds}}{8 \times 1024 \times 1024}$$

(d) (iii)

Contrasts at least two features of MIDI and MP3 file formats and comment on which is more suitable for the audio file.	3
Contrasts at least two features of MIDI and MP3 file formats	2
Contrasts one feature of MIDI and MP3 file formats.	1

- MIDI contains digital descriptions of instruments as part of hardware or software and also daa on pitch, length of note and timing. An MP3 file is a sampled audio file, composed of a

sequence of sound samples. Therefore MP3 is an approximation. MIDI is a more accurate representation of the instrumental notes in the music.

- The storage of an MP3 depends on the sample rate of sounds, the number of channels and the sample bit depth. MIDI contains not actual sound, and is merely a description of it. Therefore, a MIDI file is typically smaller than an MP3 file.
- It is not possible to reproduce vocals in MIDI but it is possible in MP3.
- MIDI is computer-generated, while MP3 typically derives from a real-life recording. MP3 has a more realistic and natural sound than MIDI.
- MP3 is the more suitable format for this Beethoven's 9th Symphony Opera.