BOARD OF STUDIES
NEW SOUTH WALES

2011 Information Processes and Technology
HSC Examination
'Sample Answers'

When examination committees develop questions for the examination, they may write 'sample answers' or, in the case of some questions, 'answers could include'. The committees do this to ensure that the questions will effectively assess students' knowledge and skills.

This material is also provided to the Supervisor of Marking, to give some guidance about the nature and scope of the responses the committee expected students would produce. How sample answers are used at marking centres varies. Sample answers may be used extensively and even modified at the marking centre OR they may be considered only briefly at the beginning of marking. In a few cases, the sample answers may not be used at all at marking.

The Board publishes this information to assist in understanding how the marking guidelines were implemented.

The 'sample answers' or similar advice contained in this document are not intended to be exemplary or even complete answers or responses. As they are part of the examination committee's 'working document', they may contain typographical errors, omissions, or only some of the possible correct answers.

Section II

Question 21 (a)

Sample answer:

ORDER TABLE

Field name	*Data Type*	*Data Format*	*Field size*	*Description*	*Example*
CUSTOMER ID	text/number		5	Unique five digit ID for each customer	12345
RESTAURANT ID	**Text (A)**	XXX9999	**7 (D)**	First three letters identifying restaurant and 4 digits	FRA1234
MENU ITEM	text		20 approx	Name of menu item	Sweet and Sour Fish
ITEM PRICE	number/ currency	$99.99	6	Price of menu Item less than $100	$12.50
QUANTITY	**Number (B)**		**2 (E)**	No of menu item ordered	2
ORDER DATE	**Date (C)**	DD/MM/YYYY	**10 (F)**	Date order placed	31/10/2011

Question 21 (b)

Answers could include:

Active listening – Project manager/team needs to use good listening techniques to ensure he/she understands the critical information required by restaurateurs. Such techniques include repeating what the customers require, summarising important features of customers' needs, mirroring, paraphrasing, and/or using clarifying questions to ensure all needs are understood.

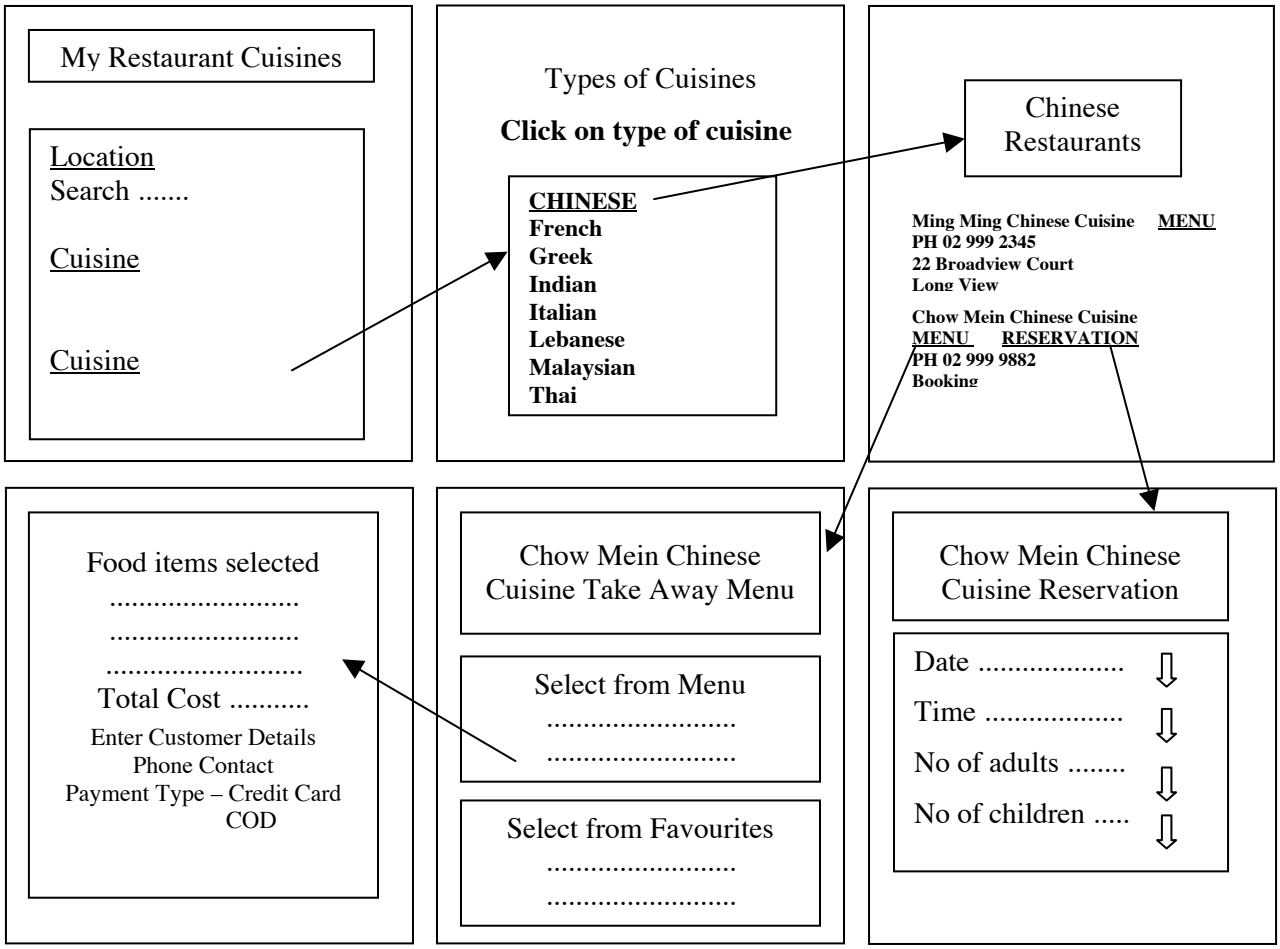
Question 21 (c)

Sample answer:

Live data utilises real data and real customers to test reliability, functionality and accuracy of an app, eg connecting to stable communications environment, such as a restaurateur's website before it is officially released to all customers.

Question 21 (d)

Sample answer:



Question 22 (a)

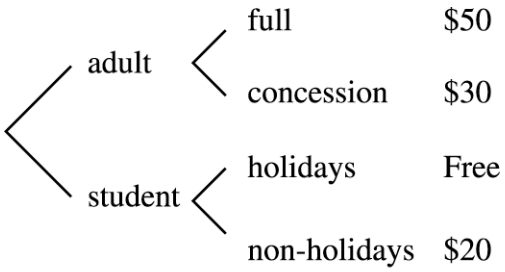
Answers could include:

The requirements report:

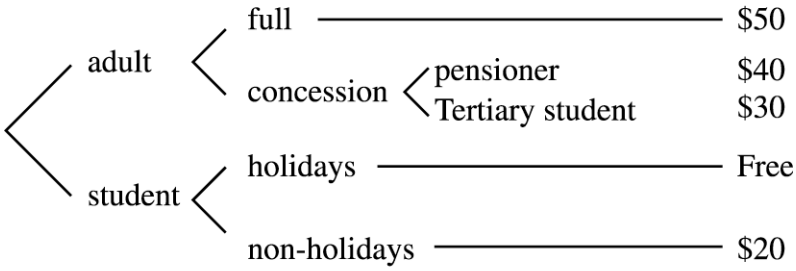
- details the time frame
- details the subprojects and their time frames
- identifies participants
- identifies relevant information technology
- identifies data/information
- identifies the needs of users.

Question 22 (b)

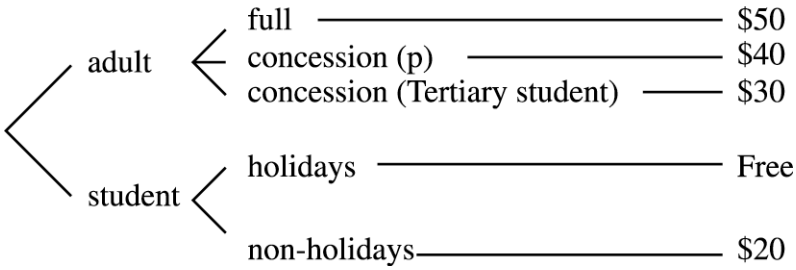
Sample answers:



OR



OR



Question 22 (c)

Answers could include:

- Lack of privacy, ie use of surveillance equipment
- Change in work routine of employees
- Loss of staff
- Lack of security, ie swapping swipe cards
- Reskilling in using new hardware/equipment
- Impact on customers – less choice, more flexibility

Question 23 (a)

Answers could include:

Response could discuss cables, eg coaxial cable, twisted pair, ethernet or optic fibre, identifying the following features:

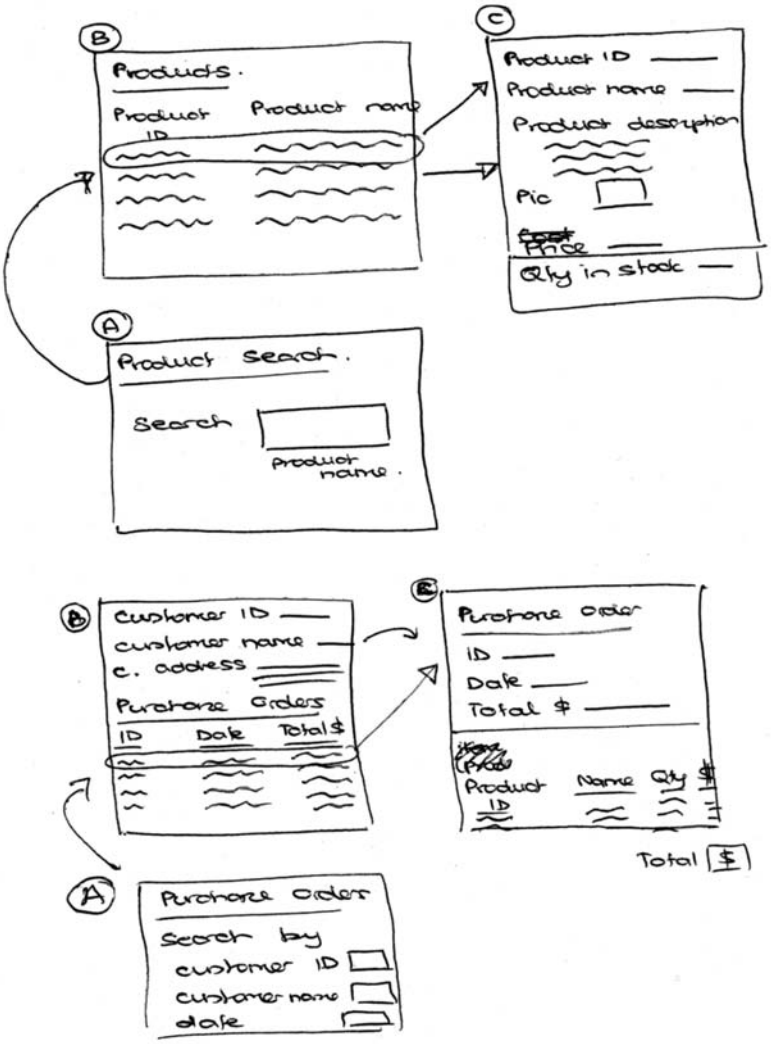
- more secure than wireless transmission media
- uses standard components that can be purchased 'off the shelf', which make it possible for non-technical people to set up the network
- optic fibre has less interferences
- wired solution is fast and reliable.

Question 23 (b)

Answers could include:

Data shown on the different screens should include:

- screen for sales staff answering questions about products: product name, description, picture, quantity in stock, functionality to construct searches, etc
- screen for staff who pack and dispatch products purchased by customers: customer address, order details (product, quantity, price), payment details (ensure payment before dispatching)



Question 23 (c)

Sample answer:

Before deciding to pay a third-party provider to store their data, a company would need to consider the following:

- DATA SECURITY: The company's data would be stored on the equipment of the third-party provider (TPSP), making the company dependent on the levels of security provided by the third-party provider. If the third party provider does not have adequate security, the company may have data inappropriately accessed, which could potentially result in a loss of competitive advantage or a breach of customer privacy. The company would need to negotiate suitable security levels with the TPSP.
- OWNERSHIP OF DATA: If the company's data is stored on the TPSP's server, it would need to establish who owns the data – the company or the TPSP?
- DEPENDENCY ON TPSP: If the TPSP goes bankrupt, the company would lose the storage of their data, and access to it. The company would need to establish the credibility of the TPSP and have contingency plans if the TPSP fails. Who would be liable for the resulting financial loss?
- CONTROL OF DATA: If a dispute arises between the company and the TPSP, the TPSP may restrict or stop access to the data by the company. The company would need to establish rights of access to the data.
- PRIVACY: The company is dependent on the protection of data provided by the TPSP. If the TPSP does not maintain data security, the company may be held responsible by customers for the loss of privacy that could occur. The company would need to ensure that breaches of privacy would not occur, and have contractual arrangements in place to establish the responsibility of the TPSP.
- DATA SENSITIVITY: A company would need to assess the sensitivity of data that it uses/stores, and perhaps manage and store the very sensitive data themselves, while allowing the TPSP to manage/store less sensitive data.
- DATA QUALITY: If the TPSP has a loss of hardware/data, company data may be lost, resulting in a loss of data accuracy and integrity. The company would need to establish backup policies with the TPSP.
- CHANGING NATURE OF WORK: As corporate data is stored by a TPSP, access to this data needs to be reliable and efficient. The TPSP will need to ensure that they have the capacity to meet the needs of the company.
- COST: Storing corporate data can be quite costly, depending on the amount required, the access needed, other aspects such as security measures that need to be taken, and suitable backup. All this can cost a considerable amount of money, therefore a company must research this thoroughly before committing itself to a TPSP.

Question 24 (a)

Sample answer:

The onboard computer is a fat client because the police vehicle requires the ability to perform processing rather than use processing on the server.

Question 24 (b)

Sample answer:

A technology issue when scanning number plates is poor quality of the image. The camera needs to be high quality to capture an accurate image from a moving vehicle.

Question 24 (c)

Answers could include:

3G mobile communications	**Other forms of wireless transmission (WiFi, IR, Bluetooth, 2G and 2.5G)**
• Uses the existing 3G mobile infrastructure – relays data via the nearest or least congested cell	• Device dependent on transmitter/receiver signal strength • Distance:range shorter
• Bandwidth layer	• Smaller
• Data rates: 2 mbs minimum	• 2G – 10 kpbs • 2.5G – 64–144 kpbs
• Security: higher point to point	• Data stream can be captured with being the intended recipient
• Applications: mobile TV, VoD, video conferencing, tele-medicine, location-based services, voice, mail, internet	• Voice and mail

Question 24 (d)

Answers could include:

- A potential problem is that an image of a number plate is incorrect and matched to the wrong driver/vehicle in a database, resulting in an infringement notice being issued to the wrong person.
- Cross-linking of data from multiple databases provides a richer picture of an individual than data from a single database. Linking data this way provides the data-holder with a greater level of power, based on the idea that 'knowledge is power'.
- Data collected for one purpose may be used for a different purpose to the reason for which it was collected. This is a breach of the Privacy Principles established by the Privacy Commissioner.
- Matching data may be done incorrectly, resulting in data being incorrectly linked. An innocent person may be linked to data from another individual, resulting in consequences for either one of them, eg linking a driving record to the wrong person, which results in them not being eligible for a job that requires a driver's licence.
- A police officer who inappropriately/illegally accesses data using the onboard computer can access much more data, since data-matching allows the linking of data from multiple sources. The potential implications of wider access are consequently greater.

Section III

Question 25 (a) (i)

Sample answer:

Batch transaction processing is the collection and storage of data for processing at a convenient, scheduled time or when there is sufficient data.

Question 25 (a) (ii)

Sample answer:

Online real-time transaction processing is important in a theatre booking system as the theatre organisation needs to have instantaneous information about sales of tickets. Real-time systems allow for the payment and allocation of seats to be done as soon as the transaction is complete. This is important to ensure that seats are not overbooked or the same seat is not allocated to two people.

Question 25 (a) (iii)

Sample answer:

An example of output from a transaction system being used as input into other information systems is a phone company that uses a transaction system to sell and keep track of all its sales of mobile phones. The output of all the transaction details from the phones sold could include information on models, cost, time of year the sales were made and locations of sales (if there were multiple outlets).

This output information from the system could be placed in a data warehouse, and data mining could be used to analyse trends and relationships in the data. An example of a trend could be that a particular phone is sold at a particular time of year or at a particular location. This trend could be used in the future for planning or marketing purposes.

Question 25 (b) (i)

Sample answer:

Data integrity is important in relation to the HRMS as the data used by the system needs to be reliable, accurate and up to date; otherwise there could be negative consequences for the organisation or the employees.

For example, if there was a medical emergency and the information stored for an emergency contact was incorrect or had not been updated, the organisation would not be able to advise the relevant people of the situation. Another example is if the educational qualifications of an employee were not verified, the employee may be granted a promotion or access to work in an area that they are not qualified to work in.

Question 25 (b) (ii)

Sample answer:

The participants in this sytem would include the employee, the management and supervisors of InterONE, and the administrative IT staff.

Employees should have access to their personal information (address, phone number, email etc) and have the ability to edit or change their information at an appropriate time. An example of this would be if an employee moved house and needed to change their address, they should be able to update this in the personal information module (PIM).

The management and supervisors of InterONE would have a higher level of access and be able to edit important information; for example, if an employee was granted a promotion, management may edit the information related to the pay grade and salary.

The administrative IT staff may have access to a range of information depending on the situation. Often administrative staff need a high level of access so that they can perform a range of tasks, to ensure that the system stays online and that employees can access it.

Question 25 (b) (iii)

Sample answer:

The collection process for adding a new employee to the new HRMS would include collecting personal information such as their name, date of birth, contact details, dependents etc, via a paper-based or online form. These details could also be collected using an interview.

A coloured graphic may be collected using a digital camera and then transferred into the system, or the employee may bring a photo in with them that could be scanned and entered into the system.

The collected information would need to be verified to ensure that it is correct. Educational qualifications may need to be checked with the relevant institutions and, in some situations, police checks may need to be made on the employee to ensure the person has no criminal history.

Question 25 (b) (iv)

Sample answer:

The HRMS is similar to paper-based systems used for transactions as they both collect and store information.

The HRMS, however, offers many advantages in comparison to a paper-based method. The HRMS, being in a digital format, is easy to edit and can include data validation techniques such as radio buttons and drop-down boxes to ensure that the information collected is accurate. This is different to paper-based forms where data is entered by a pen. These forms have few validation mechanisms and can be very hard to edit.

The HRMS can be backed up easily and stored remotely off site. This is done much more efficiently when compared to a paper-based system, which requires records to be photocopied and stored in filing cabinets.

The HRMS is physically smaller than a paper-based equivalent, as it can be stored on a hard drive, meaning that employee information can be stored without the need for large filing cabinets or as much physical space.

Offsite access can be incorporated into the HRMS so that updates and edits can be done from a range of physical locations, as opposed to a paper-based system where the employees using the HRMS need to be physically present to make changes.

Searching for information using the HRMS is also much quicker. You only need to enter a key word and the software searches through the available terms and returns the matched records within seconds. If you are searching for a particular employee's record, in a large paper-based system you would need to manually work your way through the paper-based files, which would be a slow process.

Finally, both systems would need to be secure. In the HRMS system, the records could be secured using sophisticated processes like encryption, firewalls, biometric devices, and even usernames and passwords. Paper-based documentation could still be secured using devices such as physical locks and doors; however, this process is far less sophisticated.

The electronic HRMS system does, however, have potential disadvantages if not managed appropriately. Hackers could use their skills to access the files remotely and a virus has the potential to corrupt the data.

Question 26 (a) (i)

Sample answer:

A mathematical/statistical calculation that can be used to model the impact of variables thus modelling the possible outcomes of a decision.

Answers could include:

A wide range of examples is possible, such as:

- ATAR estimates
- company (predicted) profits
- calculating home loan repayments if interest rates were to change.

Question 26 (a) (ii)

Sample answer:

Background chaining is a process that starts with a conclusion and works backwards through a series of rules to confirm the conclusion or to prove it wrong.

Question 26 (a) (iii)

Sample answer:

A knowledge engineer is a specialist who builds the knowledge base in an expert system. He/she works with experts to help codify expert knowledge in a form that is able to be used by an expert system. The knowledge engineer determines the validity of the knowledge collected and organises the knowledge into the structures required by the expert system.

Question 26 (b) (i)

Answers could include:

- Based on maps and geographical data
- Interactive
- Includes additional relevant information
- Supports decision-making
- Features labelling of roads and other points of interest.

Question 26 (b) (ii)

Sample answer:

The decision-making structure supported by the GIS is semi-structured. For example, in deciding what time to go to the movies, information about movie schedules is structured, but alternative times provide many options from which the user must choose to make a decision.

Question 26 (b) (iii)

Answers could include:

The technologies required for the online GIS system include:

- large storage devices/servers to manage large colour graphical files – rapid access rates would also be necessary
- colour display with high resolution, which are required to display the maps and related information
- high bandwidth for communication to support acceptable response times
- a database system to store maps and other text-based information
- GIS software to support the management and display of information.

Sources of data for the GIS could include:

- transport timetables from bus, train and other transport providers
- street addresses to be shown on maps
- satellite photographs of the whole of Switzerland (from NASA?)
- business details for all those businesses shown on the maps, eg pharmacies, post offices, gas stations, restaurants, hotels, cinemas, etc
- details of public buildings, etc, from government sources
- weather details from the Bureau of Meteorology.

Different formats of data would include photographic (JPG, RAW, etc), textual and numerical (timetables, weather, location details, etc), graphic (icons, advertising, etc), and hyperlinks.

Question 26 (b) (iv)

Sample answer:

The GIS system provides a time-saving advantage over alternative methods due to the fact that all the information is available from one source and accessible online. To access maps, timetables and addresses of services from alternative sources would take time to locate from the many different sources. Some information may not also be available from alternative sources when requested.

Answers could include:

- The GIS stores all information in one place, whereas manual access requires physically collating all the data – maps, timetables, locations of services etc – and being able to access them.
- Manually accessing all the data takes a lot more time compared to access via the GIS.
- Information in the GIS would be up to date, whereas the printed version would become inaccurate over time.
- The GIS is able to backup the information from the website.
- Tourists can access ALL the information from one source before visiting a country.
- The information becomes portable with an iPhone or other G3 device.
- The GIS system replaces information centres/kiosks/booths (and hence, staff).

Question 27 (a) (i)

Sample answer:

Damping is the process that modifies the signal to the output device based on the input signal. It involves changing the desired action of an actuator due to input received from a sensor. There are three types of damping: underdamping, overdamping and critical damping.

Question 27 (a) (ii)

Sample answer:

Computer-aided design (CAD) and computer-aided manufacture (CAM) would work together to produce the jigsaw puzzle. CAD is a system of designing and analysing products on a computer. It could be used to create a 3D jigsaw puzzle and the measurements then downloaded for manufacture to a CNC in the form of x, y and z coordinates. These coordinates are used to move the cutters to reproduce the jigsaw puzzle.

Question 27 (a) (iii)

Answers could include:

- Automation makes it possible for repetitive tasks to be carried out. Humans can become bored with repetitive tasks and lose focus. This boredom may reduce productivity as well as lowering the quality of products due to errors. Repetitive tasks and the associated loss of focus can also lead to safety issues. With automation, this is limited.
- Automation enables greater productivity gains as well as ensuring that the quality of each product is made to a precise standard. Machines are able to work continuously and usually at a faster rate than humans, which results in greater productivity gains. Each product is manufactured to achieve higher levels of accuracy and precision than people.

- Automated processes can be customised and goods produced more quickly and efficiently than on manual process lines.
- Automated processes can be used in dangerous environments to improve the safety of workers.
- Automated processes reduce costs as repetitive tasks can often be done faster and with less errors than people.

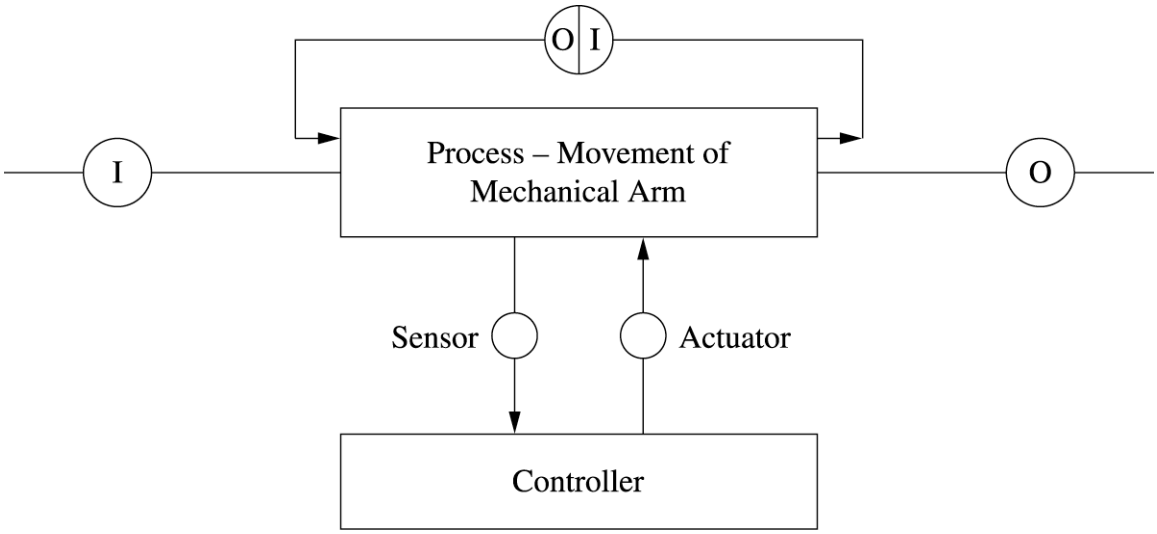
Question 27 (b) (i)

Sample answer:

An actuator is a specialised display device that performs a mechanical action (or output of the system) under the control of a signal from the controller. An example of an actuator is a motor. A DC motor can rotate in both directions and can be used with gears to produce the movement of the conveyor belt to move luggage.

Question 27 (b) (ii)

Sample answer:



Question 27 (b) (iii)

Sample answer:

For each item of luggage on the conveyor belt:

- The RFID reader reads the ID from the tag (and the ID is linked to the booking data to determine the flight/plane to which the bag is to be sent).
- A programmable-controller sends a message to the conveyor belt controller to slow the conveyor belt down.
- The programmable-controller sends a message to the arm of the position required to direct the luggage to the correct conveyor belt.
- Until the arm is in the correct position:
  - the arm-motor moves the arm
  - the sensor detects the position.
- A message is sent to the programmable controller that the arm is in position.

- The programmable-controller sends a message to the conveyor belt controller to speed up the conveyor belt.
- The luggage is directed by the arm onto another conveyor belt that takes the luggage to the correct plane.

Question 27 (b) (iv)

Answers could include:

RFID luggage handling system	*Manual/barcode luggage handling system*
• Automated movement of luggage	• Labour-intensive movement of luggage
• Fast and efficient when operating correctly. Can process more luggage than the manual system	• Processing limited by number of staff working and their speed of lifting and moving baggage
• Automated systems can run continuously, without meal breaks, holidays etc, and hence may process greater amounts of luggage in less time	• Manual system requires human labour and is subject to human error, sickness, staff not showing up for work, etc
• RFID is more accurate than barcode system	• Uses a barcode system that is less accurate than RFID
• RFID system allows for tracking of individual bags that facilitates the removal of bags if a passenger does not show up for a flight, or to locate lost luggage, etc	• Manual system is slower in locating luggage that needs to be taken off a flight, or lost luggage
• Automated system may damage luggage if something goes wrong and the conveyors/positioning arms do not stop	• Manual system may result in damage to luggage from rough handling by poorly trained staff – however, properly trained and supervised staff may result in less damage than an automated system
• RFID tags are more expensive than printing barcodes and add a cost to baggage handling	• Manual systems with printed barcodes are cheaper than RFID, but have greater staffing costs
• An RFID system may result in job losses or the need for re-skilling staff. It could also result in fewer injuries to baggage-handling staff from lifting heavy luggage items, and allow staff to be engaged in different, more meaningful and rewarding work	• Staff involved in repetitive, physical work that may result in injuries from lifting heavy luggage items
• The RFID system requires manual intervention at the beginning, end and when errors occur	• The manual system similarly requires interventions at the beginning, end and when errors occur
• Both systems require barcodes to be printed on luggage labels	• Both systems require barcodes to be printed on luggage labels

Question 28 (a) (i)

Sample answer:

Hyperlinks are text, images, audios or videos that are linked and can be selected in order to move to another node of data.

Question 28 (a) (ii)

Sample answer:

The required technical skills include a range of skills related to multimedia development, including content providers, system designers and project managers, and skills in the collection and editing of each of the media types, in design and layout, to support the use of the information technology being used, eg input devices, output devices, complex software packages and system requirements, and to troubleshoot multimedia issues (codecs, file formats, etc).

Question 28 (a) (iii)

Answers could include:

Text can be scanned from a hard copy (paper-based) source – once digitised, it can be saved as a graphic or it can be processed by OCR into editable text.

Sound can be captured by a microphone and digitised using a sound card. In this process, the analogue data is sampled at a sampling rate per second, and each sample then represented as discrete (binary) data saved as bits/bytes.

Video can be recorded on tape and digitised using a video capture card. Photographs can be digitised using a scanner, whereby the photo is broken up into many small samples or pixels (depending on the resolution) and each pixel is represented in binary.

A description of the use of digitising devices, eg scanners, OCR, photographs, microphones, sound recording, and conversion of video from tape to digital formats, should be included in candidates' responses.

Question 28 (b) (i)

Answers could include:

- A computer with the following:
  - high-resolution screen to display virtual tours, slideshows, videos
  - printer to print the brochure
  - sound card and speakers to listen to the video if it has audio, and to listen to the mp3
  - mouse, track pad and touch screen to interact with the website
  - processor speed to manage the virtual tour processing
  - sufficient RAM to store downloaded images (slides, videos, virtual tours)
  - internet access hardware (modem) to provide a wide bandwidth, to allow the fast transfer of images.

Question 28 (b) (ii)

Sample answer:

A series of still photographs are stitched together using an animation program that results in an interactive animation. Navigational buttons are added, which allow the user to control the directional viewpoint by moving the mouse or other pointing device. Parts of the animation may be cell-based or path-based animation. The animation gives the impression of standing in or near the property and allows the user to select the direction of the view.

Question 28 (b) (iii)

Answers could include:

An analysis of the following points on file storage and an examination of the file formats are included below.

- The files for the website should be stored on a web server and be backed up frequently.
- The various media types may be organised into folders on the servers.
- The searchable data for the properties may be stored in a database.
- Printable brochures are stored as PDFs to save on storage space and to make them smaller to improve download times.
- Graphics are stored as:
  - photos and maps – JPEGs/GIFs rather than bitmaps – lossy compression/lossless compression
  - floor plans – vector
- Sound is stored as:
  - WAV – lossy or lossless, MP3 lossy compression
- Videos are stored as:
  - MPEG – lossy compression
  - WMV or Quicktime
- Storage considerations include:
  - using compression to reduce file size to improve download times
  - text, floor plans and brochures – PDF – webpage elements
  - images – vector (floors plans), bitmaps – compression techniques for graphics
  - sound – downloadable MP3 – compression techniques
  - videos – file formats
  - animations.

Question 28 (b) (iv)

Answers could include:

Online real estate agency	Alternative methods
• All information in one place on a website	• Read real estate guide in newspaper or ads in real estate window
• Ring real estate agent to verify details about property	• Ring real estate agent to verify details about property
• Using virtual tour to view interior of property	• Physically visit property to view interior
• Use a property search to faster locate suitable properties faster	• Read through various property listings in (time-consuming) real estate guide
• Print out floor plan from website	• Contact agent to request a copy of floor plan or find a brochure
• Compare properties using available tool on website	• Gather information from a variety of sources and manually compare properties
• Print out comparison of each property	• Write down list of properties
• Print out brochure	• Go to agent to retrieve a brochure
• Can view properties in locations that are remote to the user	• May need to travel treat distances to physically view properties that are remote to the buyer's location
• Can receive automated alerts for suitable properties from website when they become available	• Would need to continuously visit real estate agents or manually search newspaper guides, etc, to discover properties that are newly for sale
• Can be instantly updated with new properties or sales	• Can take several days or more to update with new properties and sales

All of these features on the website are designed to improve the speed of access to information, which makes searching and updating fast and easy. Data is readily available as it's on the internet – this encourages people to learn new technological skills if they have not used this kind of technology before.