BOSTES | BOARD OF STUDIES TEACHING & EDUCATIONAL STANDARDS NSW

2016 HSC Information Processes and Technology Marking Guidelines

Section I

Multiple-choice Answer Key

Question	Answer
1	B
2	C
3	A
4	A
5	A
6	B
7	C
8	B
9	B
10	C
11	B
12	B
13	D
14	A
15	C
16	C
17	A
18	D
19	C
20	No best answer*

*All four answers were accepted as correct.

Section II

Question 21 (a)

Criteria	Marks
• Identifies hardware AND software for communication between project manager and team members	2
• Identifies a feature of hardware or software for communication	1

Sample answer:

- Hardware: computer, laptop, internet access via comms network, microphone, speaker, webcam
- Software: browser, video conferencing software, email software

Question 21 (b)

Criteria	Marks
• Provides reasons why a communication management plan is needed	2
• Identifies a feature of a communication management plan	1

Sample answer:

The project manager needs a general plan or framework for how information will be distributed to all team members: when the information will be distributed to team members, timing/scheduling of online chats and video conferencing.

Question 21 (c)

Criteria	Marks
• Describes how VoIP could be used in this situation	3
• Outlines features of VoIP that could be used in this situation	2
• Identifies a feature of VoIP	1

Sample answer:

VoIP can be used between project managers and team members in different global locations at any time of the day providing they set up a time schedule for the meeting.

The project manager can organise meetings between all team members or just individual team members to discuss the app development progress, for future planning and to provide feedback.

The project manager and team members would require access to the Internet, a phone, either analog or a smart phone (digital) or a computer with speakers and a microphone to use VoIP.

Question 21 (d)

Criteria	Marks
• Explains a variety of issues that could arise from team members working in different global locations	3
• Outlines an issue relating to team members working in different global locations	2
• Identifies an issue relating to working in different global locations	1

Sample answer:

With team members in different global locations issues could arise with the scheduling of video conferencing due to time zone differences, as well as unreliable and unsecure internet connections during online chat and video conferencing. Due to the changing nature of the work environment, ensuring that all team members are meeting deadlines could be more difficult as they are located globally and this could result in financial and productivity loss.

Question 22 (a)

Criteria	Marks
• Outlines potential risks in modifying the website	3
• Outlines a potential risk in modifying the website	2
• Identifies a risk in modifying a website	1

Sample answer:

Potential risks could include the need for the current web-based information systems to be offline to make the changes. The offer of free movies may increase traffic beyond the planned capacity of the website and congestion could lead to incomplete registrations.

Question 22 (b)

Criteria	Marks
• Explains why the agile development method would be appropriate for this modification	3
• Outlines a feature of the agile development method that would be appropriate for this modification	2
• Identifies a feature of the agile method	1

Sample answer:

The agile development method is particularly well suited to web-based software development. A small team of developers can produce a solution and modify it quickly and easily should a problem arise. If the information system is unable to cope with capacity, the developers can make adjustments in a short period of time.

Question 22 (c)

Criteria	Marks
• Recommends and clearly justifies a type of test data to evaluate the system performance	3
• Recommends and provides an example and/or a type of test data to evaluate the system performance	2
• Identifies a feature of test data	1

Sample answer:

Simulated test data aims to test a range of performance boundaries under simulated operational conditions without the need for enrolling hundreds of users to test volume related conditions. It aims to evaluate the system performance under different conditions before the system is live to the customers.

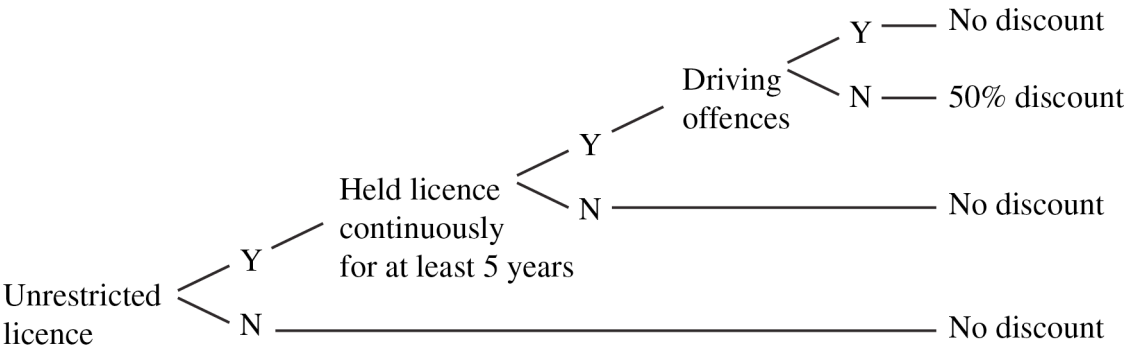
Answers could include:

Volume testing with appropriate justification.

Question 23 (a)

Criteria	Marks
• Draws a decision tree that shows a sound understanding of the rules	3
• Draws a diagram that shows some understanding of the rules	2
• Draws a diagram that shows a basic understanding of the rules	1

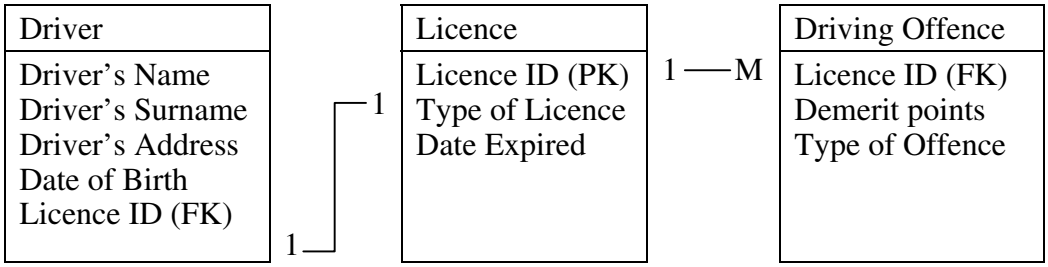
Sample answer:



Question 23 (b)

Criteria	Marks
• Draws a schematic diagram that shows a sound understanding of the organisation of the data • Includes primary keys, foreign keys and relationships	3
• Draws a schematic diagram that shows some understanding of the organisation of the data • Includes some relevant fields	2
• Identifies a feature of a schematic diagram OR • Draws a schematic diagram that shows a basic understanding of the organisation of the data	1

Sample answer:



Question 23 (c)

Criteria	Marks
• Constructs a query that shows a sound understanding of SQL • Includes most of the features such as field names, tables, relational and logic operators	3
• Constructs a query that shows an understanding of SQL • Includes some features	2
• Identifies a feature of a query	1

Sample answer:

SELECT: Driver's Name, Driver's Surname, Type of Licence, Date of Birth

FROM: Driver, Licence

WHERE: Date of Birth >= 1972 and <= 1995

Question 24 (a)

Criteria	Marks
• Describes the operation of the client-server architecture in this situation	3
• Outlines the operation of the client or server in this situation	2
• Identifies a feature of a network	1

Sample answer:

The client in this scenario is the device logging into the car insurance company's server requesting an insurance policy. The client waits for an acknowledgement from the server. The server processes the request and responds to the client with the appropriate information.

Question 24 (b)

Criteria	Marks
• Demonstrates a clear understanding of why the different transmission media are used in this system	4
• Demonstrates some understanding of why the different transmission media are used in this system	3
• Outlines features of different transmission media in this system	2
• Identifies a feature of transmission media	1

Sample answer:

Satellite required to track the car via the GPS.

Wireless Technology includes the mobile network required to send the data to the server for processing. The driver at home can access the web portal via a wireless network.

Wired Technology: Cables such as fibre optics to connect the insurance server to the company intranet, allowing a secure connection.

Question 24 (c)

Criteria	Marks
• Identifies the relationship between analysing and processing in this system and draws out implications of this	5
• Identifies the relationship between analysing and processing in this system and some implications of this	4
• Demonstrates some understanding of analysing and processing in this system	3
• Demonstrates a basic understanding of analysing and/or processing in this system	2
• Identifies a feature of the information processes	1

Sample answer:

Analysing allows the user to search the database to locate data about distance travelled over time, the types of road surface and time of day. The company can search the database to predict new billing rates. This data could be represented in a report format to show/display driving patterns and determine new policies.

As users log into the system they can search the database to check their driving patterns and then make changes to their driving patterns in order to reduce the cost of their insurance policy.

When users enter their login details into the system the analysing process will search through the database to verify the correct login details are entered. Once the details are confirmed, this will be processed to allow users access to the extranet to view their accounts.

Processing also refers to the continuous updating of data and performing of calculations to determine the cost of the insurance policy based on the distance travelled.

Section III

Question 25 (a)

Criteria	Marks
• Explains why data validation is important in a transaction processing system	2
• Identifies a feature of data validation	1

Sample answer:

Data validation is important in a TPS to ensure the data collected is reasonable and meets specified criteria (the correct data type and format). Data that is incorrect at the time of collection could cause problems later in the transaction.

Question 25 (b)

Criteria	Marks
• Describes features of RFID tags using an appropriate example	3
• Outlines how RFID tags operate	2
• Identifies a feature of RFID	1

Sample answer:

Radio-Frequency Identification (RFID) uses radio waves to read and capture information stored on a tag attached to an object. The RFID requires an antenna, a transceiver to decode the data stored on the tag and the device (RFID) that has been programmed with information.

One example where an RFID tag can be used is to track products in a store. When the product with the RFID tag passes through an antenna, which could be at the doors of the store, it detects the RFID and activates a signal from the antenna.

Question 25 (c)

Criteria	Marks
• Demonstrates a clear understanding of real-time and batch processing in this situation	3
• Demonstrates some understanding of real-time and/or batch processing in this situation	2
• Identifies a feature of real-time or batch processing	1

Sample answer:

Real-time transactions occur immediately. The individual's banking details and account balance are occurring in real time. The batch processing is the transfer of money from the **bank** to the **merchant**.

Accounts linked to credit cards appear to be in real time as they are swiped through an EFTPOS machine. However, the transaction of a credit card is not complete until the funds have been transferred to the provider. This could be processed during the evening or the next day. If a debit account is used, the translation takes place in real-time.

Question 25 (d)

Criteria	Marks
• Clearly explains the backup procedures that could be used to recover data in this situation	4
• Outlines how backup procedures could be used to recover data in this situation	3
• Shows some understanding of backup procedure(s)	2
• Identifies a feature of backup	1

Sample answer:

There are three different types of backup procedures that could be used. These include full backup, incremental backups and differential backups. A full backup is a complete copy of all data within the system. A system restore is an easier process than a full backup, should the system fail. The data is simply copied back to its original location. Incremental backups involve making partial backups that copy all files that have changed or been created since the last backup – the last backup may have been a full or partial backup. A differential backup backs up only the files that have changed since the last full backup. Grandfather – father – son backup refers to a common rotation scheme for backup media. In this scheme there are three or more backup cycles, such as daily, weekly and monthly.

Question 25 (e) (i)

Criteria	Marks
• Describes the data that needs to be collected by the virtual shopping app in order to process the sales	3
• Outlines the data that needs to be collected to process the sales	2
• Identifies a feature of data	1

Sample answer:

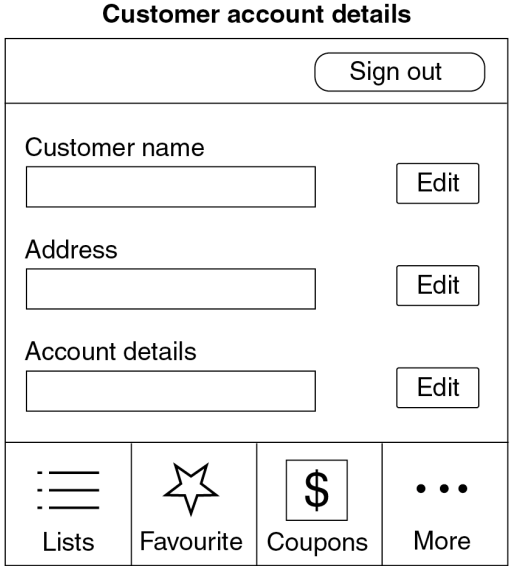
The virtual shopping app needs to collect details of the items such as cost, type of item and quantity in order to process the sales. The app also needs to collect payment details such as the bankcard number and customer details such as name and address.

Question 25 (e) (ii)

Criteria	Marks
• Clearly designs suitable data entry screens • Justifies the screen elements used to capture the data in this situation	5
• Designs suitable data entry screens • Describes the screen elements used to capture the data in this situation	4
• Designs data entry screen(s) • Outlines the screen elements used to capture the data	3
• Designs data entry screen(s)	2
• Identifies a feature of a screen	1

Sample answer:

Scanning the product allows for fewer data errors, ensuring the data is valid. Incorporating images makes for easy navigation and a log/sign out button allows for security. The Edit and the Add buttons allow for changes by the user. Text boxes allows the user to enter their details.



Question 26 (a)

Criteria	Marks
• Explains how management information systems support decision-making	2
• Identifies a feature of management information systems	1

Sample answer:

Management information systems are computerised base systems that provide participants (managers) with the tools (ie a database, spreadsheet) to organise, evaluate and efficiently manage departments in an organisation in order to provide past, present and prediction information that helps decision-making. MIS provide efficiency and effectiveness of strategic decision-making.

Question 26 (b)

Criteria	Marks
• Clearly differentiates between absolute referencing and relative referencing in a spreadsheet • Provides a relevant example for each	3
• Demonstrates an understanding of absolute referencing AND/OR relative referencing in a spreadsheet • Provides a relevant example	2
• Identifies a feature of referencing in a spreadsheet	1

Sample answer:

Absolute referencing is used when the formula is constantly referring to a particular cell and that cell reference does not change when the formula is copied or filled down/across. When designing the formula, a dollar ($) sign is used in the cell reference. For example =B2 * F2 is filled down and would become =B3 * F2

Relative referencing: when a cell reference is copied across multiple cells it changes based on the relative position of the rows and columns. For example: when copying the formula = A1 + B1 to the next row/column it becomes = A2 + B2.

Question 26 (c)

Criteria	Marks
• Describes how different types of charts can assist decision-making in this situation	3
• Outlines how different charts are used in decision-making	2
• Identifies a feature of a chart	1

Sample answer:

There is a range of charts that the company could use, ie column, line, bar, pie.

A column/bar chart can show sales and returns of products over a period of time. The company can use this information to determine which products are commonly sold and which are less popular.

A line chart shows trends and represents the number of products sold or returned over a period of time between the different stores. From the sales or returns, the company can see which product is most popular and which products are being returned.

A pie chart can show the contribution or percentage of the type of complaint calls from a store or online. The company can use this information to improve their customer service or address the most common complaints.

Question 26 (d)

Criteria	Marks
• Explains, using an example, the role of the knowledge base and of the inference engine in the development of an expert system	4
• Describes, using an example, the role of the knowledge base and of the inference engine in the development of an expert system	3
• Outlines the role of the knowledge base OR the inference engine in an expert system	2
• Identifies a feature of expert systems	1

Sample answer:

Expert systems use a problem-solving model that organises and controls the steps that need to be taken to solve the problem. One part of this model is a knowledge base that is an organised set of knowledge about a particular subject such as a medical condition. It contains certain facts (medical facts such as symptoms for different diseases, runny nose, high temperature, sneezing, types of test, recommended types of tablets) and also judgemental knowledge that an expert (doctor) uses when arriving at a decision or diagnosis.

The other part of the model is the inference engine, which is a set of 'if then' rules/structure on which to base decisions. It is the part of the expert system that does the reasoning by manipulating and using the knowledge in the knowledge base.
For example:

IF symptom is runny nose

AND high temperature

AND sneezing

AND small greyish spots inside mouth

THEN measles

A user of the expert system (a medical doctor) is asked a series of questions (such as has the patient got a runny nose) and on the basis of the answers, the expert system can arrive at an answer or diagnosis.

Question 26 (e) (i)

Criteria	Marks
• Provides a clear explanation of how data mining can be used in this situation	3
• Outlines how data mining can be used in this situation	2
• Identifies a feature of data mining	1

Sample answer:

Data mining occurs when searching the CRMS database. It looks for patterns in wind, speed and direction, moisture levels, water temperature and air pressure, and the relationship between the different data to predict future behaviour of cyclones. Reports generated can be used in planning for future cyclones.

Question 26 (e) (ii)

Criteria	Marks
• Clearly identifies issues and provides points for and/or against measures to reduce negative impacts on participants in decision support systems	5
• Clearly identifies issues and provides points for and/or against at least one measure to reduce negative impacts on participants in decision support systems	4
• Describes a measure to reduce negative impacts on participants in decision support systems	3
• Outlines a negative impact(s) on participants in decision support systems	2
• Identifies an issue related to decision support systems	1

Sample answer:

The CRMS is designed to assist decision-making by suggesting potential solutions rather than definitive answers. In semi-structured and unstructured situations, inferences must be made by the participants based on the information generated by the CRMS DSS. Participants bear the responsibility for decision-making and experience plays an important role in making the final decision. They must be given training and practice in making decisions utilising the information provided by the CRMS DSS. It is inevitable that some inferences made will prove to be incorrect. In the case of erroneous inferences, the negative impacts apparent in using the CRMS DSS can be reduced by additional training combined with simulations and the use of different scenarios, to practise making decisions and improving the consistency of decisions using the information from the CRMS DSS.

Question 27 (a)

Criteria	Marks
• Explains how CAD/CAM is used in an automated manufacturing system	2
• Identifies a feature of CAD/CAM	1

Sample answer:

Computer-aided Design (CAD) refers to software that is used to design and analyse a product and Computer-aided Manufacturing (CAM) refers to the tools that automate the manufacturing process. CAD/CAM is the use of computers to perform many of the functions related to design and production in an Automated Manufacturing System. Products are designed using the CAD software and the data is then fed into a CAM system containing devices that run under Computer Numerical Control such as a CNC lathe.

Question 27 (b)

Criteria	Marks
• Clearly explains how automated mail sorting may be considered a human-centred system	3
• Outlines features of automated mail sorting OR human-centred systems	2
• Identifies a feature of automated mail sorting OR human-centred systems	1

Sample answer:

Mail sorting involves the collection, sorting and delivery of letters and small, flat parcels to homes and businesses. Automation of the sorting process assists the human participants by quickly and accurately sorting the items into groups; the automation removes the boredom and repetition for the humans and improves the overall efficiency of the collection and delivery services because it helps the participants work more effectively and hopefully with higher levels of job satisfaction.

Question 27 (c)

Criteria	Marks
• Identifies the type/s of processing and provides an explanation for this	3
• Identifies the type/s of processing and attempts to provide an explanation	2
• Identifies a feature of processing in an automated manufacturing system	1

Sample answer:

This automated manufacturing system can be categorised as a discrete system because it performs a single task in a small interval of time, producing the final product, ie the smart phone case, to the exact specifications of the customer. It can also be classified as a batch system when it is producing multiple copies of the customer's design in a situation where a bulk order has been requested.

Question 27 (d)

Criteria	Marks
• Provides a clear explanation of the advantages of using an automated manufacturing system when performing repetitive tasks	4
• Provides some advantages of using an automated manufacturing system when performing repetitive tasks	3
• Outlines the use of an automated manufacturing system when performing repetitive tasks	2
• Identifies a feature of an automated manufacturing system	1

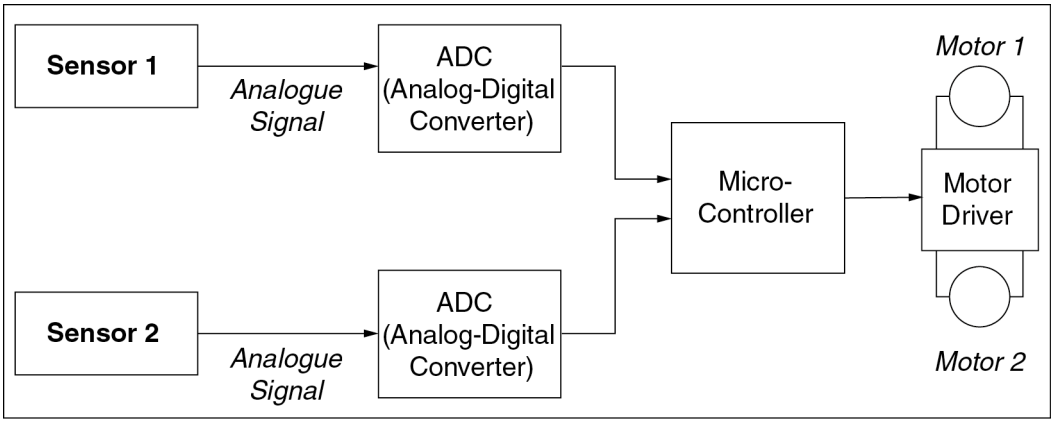
Sample answer:

Repetitive tasks are subject to human error and fatigue but an AMS will continue the process until it runs out of supplies or breaks down. Reliability is important to ensure a consistent quality of manufacturing. There is less variation from one item to the next. Using an AMS for embroidery ensures greater consistency of the pattern on each item, stitch size etc.

Question 27 (e) (i)

Criteria	Marks
• Draws a substantially correct block diagram that clearly illustrates the interactions of the information technology items in the system	3
• Draws a block diagram illustrating some of the interactions of the information technology items in the system	2
• Shows some understanding of a block diagram or the system	1

Sample answer:



Block diagram of automated line-following robot.

Question 27 (e) (ii)

Criteria	Marks
• Provides a clear explanation of the operation of the sensors and actuators in the parcel delivery robot	5
• Provides an explanation of the operation of some of the sensors and actuators in the parcel delivery robot	4
• Describes the operation of the sensors and/or actuators in the parcel delivery robot	3
• Outlines the operation of sensors and/or actuators in the parcel delivery robot	2
• Identifies a feature of actuators or sensors	1

Sample answer:

Actuators in this situation are display devices performing mechanical actions under the control of a signal from a controller. In this situation, the actuators are the two electrical motors that drive the wheels of the delivery robot. These are most likely direct current DC motors capable of high precision, fast acceleration and high reliability. They are capable of producing high torque, so the drive shaft can move a load easily. DC motors can change direction by reversing the current flowing through the windings of the DC motor.

Optical or light sensors work in two ways. First, the moving object breaks a light beam (or series of light beams) and thus its position is known because the beams are located at regular intervals and the location of the beam corresponds to a particular location when the beam is broken. In the second approach, a light beam is directed at an object and the amount or degree of reflected light changes depending on the distance from the other object. Proximity sensors are used to determine when two objects are getting close to each other. Some use light while others use ultrasound. Motion may be detected by a Potentiometer, magnetic transducers, accelerometer, gyroscope or contact sensors.

Question 28 (a)

Criteria	Marks
• Provides an appropriate reason for the use of a storyboard in designing a multimedia system	2
• Identifies a feature of storyboards	1

Sample answer:

A storyboard is used in designing a multimedia system to show the organisation of information, the different media types and navigational paths. This shows the link between different frames.

Question 28 (b)

Criteria	Marks
• Clearly distinguishes between morphing and distorting in multimedia	3
• Outlines differences between morphing and distorting	2
• Identifies a feature of morphing or distorting	1

Sample answer:

Morphing changes one image or shape into another through a seamless transition. Morphing can be used as a visual effect, for example an actor may be morphed into an alien. The process of distorting is the manipulation of an image by distorting or transforming. As the image is stretched, the pixels move apart creating a gap. The new distorted image must fill the gap and therefore the software used will fill the gaps with similar coloured pixels.

Question 28 (c)

Criteria	Marks
• Describes how leisure and entertainment multimedia can be used in an educational setting	3
• Outlines how leisure and entertainment multimedia can be used in an educational setting	2
• Identifies a feature of multimedia	1

Sample answer:

3D adventure games, sporting games and interactive movies are forms of leisure and entertainment that can be used in an educational setting to teach a particular concept eg a sports concept. They have become extremely popular forms of multimedia applications due to their high level of interactivity. The new games provide high levels of interactivity and realism to captivate students. They are based mainly on animations and videos, rather than text, due to their entertainment purposes and hence engage young people.

Games such as Simcity and Minecraft make use of animation and video with the emphasis on making learning more engaging and interactive.

Question 28 (d)

Criteria	Marks
• Provides a clear explanation of how the merging of radio, television, communications and the internet has changed the way users access multimedia systems	4
• Explains how the merging of radio and/or television with communications and the internet has changed the way users access multimedia systems	3
• Describes how the merging of radio and/or television and/or communications and/or the internet has changed the way users access multimedia systems	2
• Identifies a feature of the merging of radio or television or communications or the internet	1

Sample answer:

Different technology such as the internet, radio and TV can be merged to create more interactive and user-friendly technologies. Television can be now viewed online allowing a wider range of viewing options.

Streaming technology allows live entertainment to be delivered over computer networks to viewers worldwide. This growing interconnection between radio, TV and the internet has led to the need for increased data connection speeds to improve the quality of data streaming.

Websites like YouTube have recently begun to offer free live data streaming events. Multimedia technology has made it possible to now access online radio broadcasts that can be downloaded.

Further advancements in mobile phone technology have meant that radio and television can now be accessed on a mobile phone with wireless connectivity.

Question 28 (e) (i)

Criteria	Marks
• Identifies the layout and design skills needed by developers of this multimedia system	3
• Identifies the layout or design skills needed by developers of this multimedia system	2
• Identifies a skill that developers need	1

Sample answer:

Skills in the organisation of layout screens are required, to develop a consistent look between screens. The developers need to have a good understanding of colour and balance, fonts, size and typography to ensure that the design is suitable for the particular audience. Skills in using the required software application and technical skills are also required.

Question 28 (e) (ii)

Criteria	Marks
• Provides a clear explanation of the advances in hardware technologies that have influenced the development of the kiosk	5
• Provides an explanation of some advances in hardware technologies that have influenced the development of the kiosk	4
• Describes advances in hardware technologies that have influenced the development of the kiosk	3
• Outlines an advancement in hardware technology relevant to the kiosk	2
• Identifies an advancement in hardware technology	1

Sample answer:

Video and audio files are very large therefore it is important to compress the files so that they can be sent over a communication network. In this scenario, video, audio and images are sent over the internet so that patients and doctors can communicate. Compression is used for video and audio files to reduce the file size so that the data can be transmitted over a communication network.

Fast CPU processing and increases in RAM size allow for real-time video conferencing and faster uploading of large images and files. Improvements in screen resolution ensure a clear image of doctor/patient during video conferencing.

2016 HSC Information Processes and Technology Mapping Grid

Section I

Question	Marks	Content	Syllabus outcomes
1	1	9.3 Modems	H1.1
2	1	9.1 Active listening	H5.1
3	1	9.2 Suitable DB for existing card based system	H4.1
4	1	9.2 Privacy	H2.1, H3.2, H5.2
5	1	9.2 Collecting and storing	H2.2
6	1	9.2 Data types	H1.1
7	1	9.1 System development	H6.1
8	1	9.1 System development approach	H6.2
9	1	9.3 Transmission media	H1.1
10	1	9.3 Network hardware component	H1.1
11	1	9.3 Error detection	H1.1
12	1	9.2 Search string	H2.1
13	1	9.3 Bridge in a communication system	H1.1
14	1	9.3 Hybrid network topology	H1.1
15	1	9.1 Data flow diagram symbols	H1.2, H2.1
16	1	9.1 Context diagram	H2.1
17	1	9.3 Hub in a communication system	H1.1
18	1	9.3 Communication system framework	H1.1
19	1	9.1 Conversion method	H6.2
20	1	9.2 Search engine	H1.1

Section II

Question	Marks	Content	Syllabus outcomes
21 (a)	2	9.1 Implementing	H1.1, H1.2, H3.1
21 (b)	2	9.1 Communication plans	H5.1
21 (c)	3	9.3 Messaging systems	H5.1
21 (d)	3	9.3 Social and ethical issues in communication systems	H3.1, H5.2
22 (a)	3	9.1 Feasibility – risks of the project	H1.1, H3.1, H5.1
22 (b)	3	9.1 Compare developmental approaches	H6.2
22 (c)	3	9.1 Testing and evaluating solutions	H1.1, H5.1
23 (a)	3	9.1 Tools used in designing a system	H1.1, H5.1
23 (b)	3	9.2 Logical organisation of a database	H1.1
23 (c)	3	9.2 Construct an SQL query	H6.1
24 (a)	3	9.2 Client–server architecture	H1.1, H1.2
24 (b)	4	9.3 Transmission media	H1.1, H4.1
24 (c)	5	9.2 Analysing and processing	H5.1

Section III

Question	Marks	Content	Syllabus outcomes
25 (a)	2	Transaction processing systems	H1.1
25 (b)	3	Transaction processing systems	H4.1
25 (c)	3	Transaction processing systems	H1.2, H2.1
25 (d)	4	Transaction processing systems	H5.1
25 (e) (i)	3	Transaction processing systems	H6.1
25 (e) (ii)	5	Transaction processing systems	H2.2
26 (a)	2	Decision support systems	H1.1
26 (b)	3	Decision support systems	H4.1
26 (c)	3	Decision support systems	H1.2, H2.1
26 (d)	4	Decision support systems	H5.1
26 (e) (i)	3	Decision support systems	H6.1
26 (e) (ii)	5	Decision support systems	H2.2
27 (a)	2	Automated manufacturing systems	H1.1
27 (b)	3	Automated manufacturing systems	H4.1
27 (c)	3	Automated manufacturing systems	H1.2, H2.1
27 (d)	4	Automated manufacturing systems	H5.1
27 (e) (i)	3	Automated manufacturing systems	H6.1
27 (e) (ii)	5	Automated manufacturing systems	H2.2
28 (a)	2	Multimedia systems	H1.1
28 (b)	3	Multimedia systems	H4.1
28 (c)	3	Multimedia systems	H1.2, H2.1
28 (d)	4	Multimedia systems	H5.1
28 (e) (i)	3	Multimedia systems	H6.1
28 (e) (ii)	5	Multimedia systems	H2.2