



NSW Education Standards Authority

2020 HIGHER SCHOOL CERTIFICATE EXAMINATION

Information Processes and Technology

**General
Instructions**

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black pen
- Draw diagrams using pencil

**Total marks:
100****Section I – 20 marks** (pages 2–10)

- Attempt Questions 1–20
- Allow about 40 minutes for this section

Section II – 40 marks (pages 11–14)

- Attempt Questions 21–24
- Allow about 1 hour and 10 minutes for this section

Section III – 40 marks (pages 15–19)

- Attempt TWO questions from Questions 25–28
- Allow about 1 hour and 10 minutes for this section

Section I

20 marks

Attempt Questions 1–20

Allow about 40 minutes for this section

Use the multiple-choice answer sheet for Questions 1–20.

- 1** A manager needs to schedule tasks for the development of a new system.

Which is the most effective tool for scheduling?

- A. Journals
- B. Gantt chart
- C. Funding plan
- D. Communication plan

- 2** Which communication system would best enable a meeting to take place between people working in different locations?

- A. VoIP
- B. Email
- C. Voicemail
- D. Text messaging

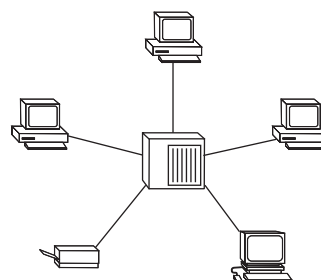
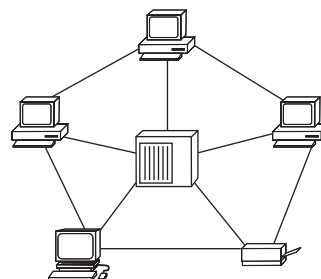
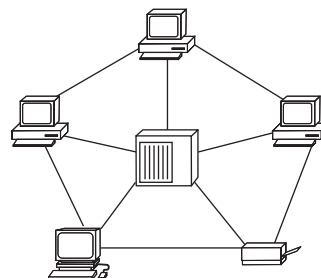
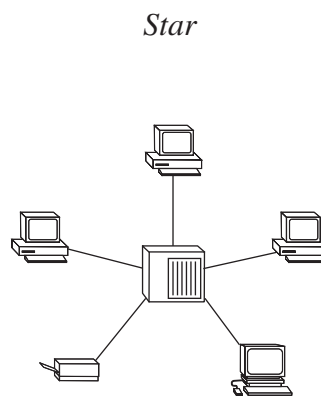
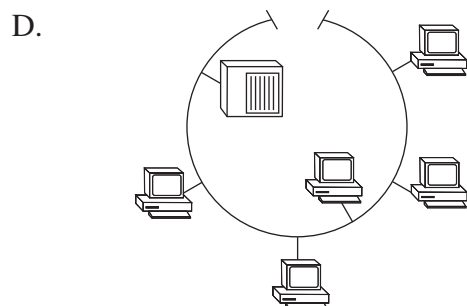
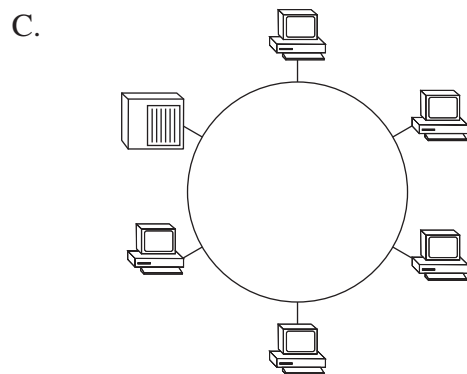
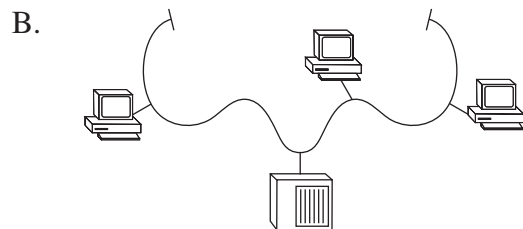
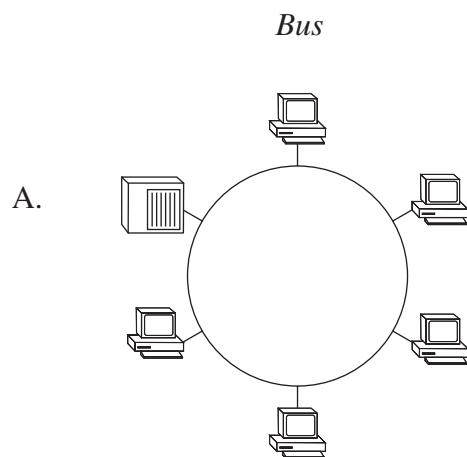
- 3** A webpage displays the following information. Each underlined word is a link to another webpage.

For digital devices, the bandwidth is usually expressed in bits per second (bps) or bytes per second. For analog devices, the bandwidth is expressed in cycles per second, or Hertz (Hz).

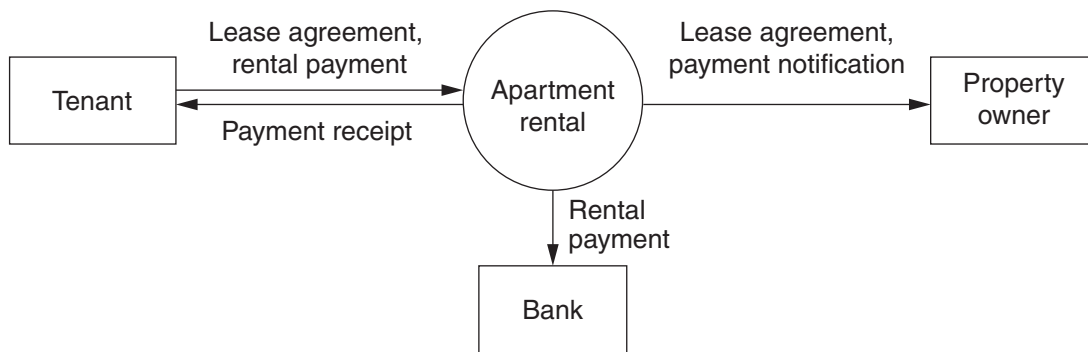
Which method of data organisation is being used?

- A. HTML
- B. Hypertext
- C. Storyboard
- D. Data schema

4 Which pair of diagrams correctly illustrates both a bus and a star network topology?



- 5 The following context diagram represents an apartment rental system.



Which row of the table identifies an external entity, a process and a data flow?

	<i>External entity</i>	<i>Process</i>	<i>Data flow</i>
A.	Bank	Apartment rental	Tenant
B.	Lease agreement	Rental payment	Bank
C.	Tenant	Apartment rental	Lease agreement
D.	Property owner	Rental payment	Payment receipt

- 6 Which communication system provides a means of sharing and collaboration by allowing a group of people to enter, modify and contribute one or more pages of related text?

- A. Wiki
- B. Email
- C. Podcast
- D. RSS feed

- 7 The following tasks need to be carried out:

- client installation and protocol assignment
- installation of software and sharing with users.

The tasks are likely to be carried out by a network

- A. administrator.
- B. analyst.
- C. engineer.
- D. technician.

- 8 A property management company wants to introduce an online system for residents to report maintenance issues. Although the residents have the equipment and skills to access the internet, the company is not sure whether the residents would use the system and whether the system would be worth the development costs.

Which combination of feasibility concerns applies in this situation?

- A. Technical and economic
 - B. Technical and scheduling
 - C. Operational and economic
 - D. Operational and scheduling
- 9 A function of the SSL protocol is to encrypt data being transmitted between a browser and a
- A. modem.
 - B. web server.
 - C. mail server.
 - D. print server.
- 10 Which row of the table correctly identifies an application level protocol, a communication control and addressing level protocol, and a transmission level protocol?

	<i>Application level</i>	<i>Communication control and addressing level</i>	<i>Transmission level</i>
A.	smtp	SSL	http
B.	Token ring	IP	smtp
C.	IP	smtp	Token ring
D.	http	TCP	Ethernet

- 11 A parcel delivery service is experiencing efficiency issues within its system.

Which approach would best identify the issues?

- A. Develop a requirements prototype
- B. Survey other parcel delivery services
- C. Interview users of the current system
- D. Conduct a feasibility study of the system

- 12** Which of the following is the best way to validate information retrieved from the internet?
- A. Identify the author of the information
 - B. Verify information with a variety of other sources
 - C. Access the information using a variety of search engines
 - D. Consider the position in which the source appears in the search engine's page
- 13** Which of the following best describes the transmission of a message using packet switching?
- A. Data packets may follow different routes and may arrive at different times in different order.
 - B. Data packets will always follow the same route and arrive at the same time in the same order.
 - C. Data packets will always follow the same route but could arrive at different times in different order.
 - D. Data packets may follow different routes but will always arrive at the same time in the same order.

Use the following information to answer Questions 14 and 15.

This diagram shows the structure of a sporting club's database. Four features have been labelled *W*, *X*, *Y* and *Z*.




14 Which labelled feature is an example of an attribute in the database?

- A. Feature *W*
- B. Feature *X*
- C. Feature *Y*
- D. Feature *Z*

15 Which row of the table correctly identifies suitable data types for Member ID and Membership fee?

	Member ID	Membership fee
A.	Number	Integer
B.	Number	Currency
C.	Text	Integer
D.	Text	Currency

16 The following email has been sent.

	
From:	Chris
To:	Bob
CC:	Dan
BCC:	Ash
Subject:	Important update
Dear Colleagues, Please note that tomorrow's meeting has been cancelled. Best regards, Chris	

Which of the following statements is correct?

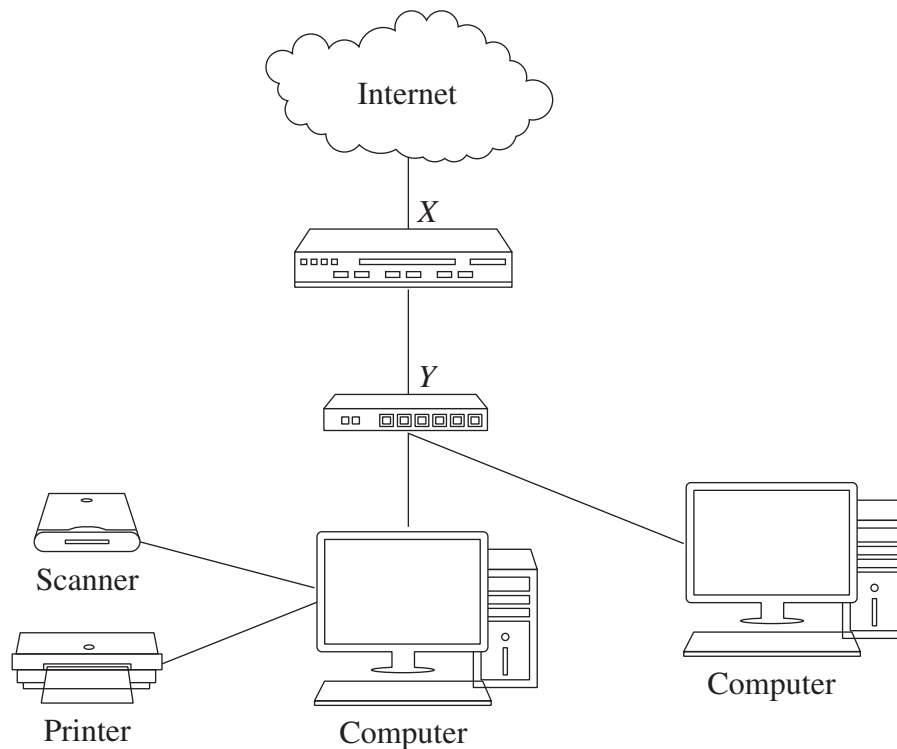
- A. Bob and Dan are aware that Ash received the email.
- B. Dan is aware that Ash and Bob received the email.
- C. Ash is aware that Bob and Dan received the email.
- D. All recipients are aware that the others received the email.

17 A charity has branches in each state of Australia. Each branch stores and keeps track of its own donation records, but the branches are connected via a wide area network and the donation records are accessible by users from any of the branches.

Which type of database is being used?

- A. Centralised
- B. Distributed
- C. Hypermedia
- D. Local

- 18 The following diagram shows parts of a network.



Which hardware components are *X* and *Y* most likely to be?

	<i>Component X</i>	<i>Component Y</i>
A.	Switch	Hub
B.	Router	Switch
C.	Router	Gateway
D.	Switch	Bridge

- 19 A school is replacing its current fee payment system with a new system. While the new system is being implemented and tested, the old fee payment system remains operational. Once the new fee payment system is fully operational, the old system will be removed.

Which conversion method is being used?

- A. Pilot
- B. Direct
- C. Phased
- D. Parallel

- 20** A university has decided to update its online learning system. It wishes to engage a technology specialist to carry out the task. It also wants to be able to give input and refine its requirements during the development process.

Which combination of development approaches should the university use?

- A. Outsourcing and agile
- B. Outsourcing and traditional
- C. Participant development and agile
- D. Participant development and traditional

Section II

40 marks

Attempt Questions 21–24

Allow about 1 hour and 10 minutes for this section

Answer each question in the appropriate writing booklet. Extra writing booklets are available.

If you include diagrams in your answer, ensure that they are clearly labelled.

Question 21 (10 marks) Use the Question 21 writing booklet.

- (a) How could a project manager use communication skills to resolve a disagreement between two team members? **3**

- (b) A packet, containing two data bytes, was transmitted. During transmission, the data bytes were corrupted. The following table shows the data sent and the data received. The last bit of each byte is the parity bit.

<i>Sent</i>	<i>Received</i>
11001010 10011001	11011011 10101010

- (i) Why was there no error detected in the transmission? **2**
- (ii) How could *checksum* be used to detect that there was a transmission error in this situation? **2**
- (c) A roadside service company uses the following table to determine the membership level of its members. **3**

<i>Conditions</i>	<i>Rules</i>			
Valid driver's licence	Y	Y	Y	N
Member ≤ 5 years	Y	N	N	N
Member > 5 and ≤ 15 years	N	Y	N	N
Member > 15 years	N	N	Y	N
<i>Actions</i>				
Silver membership	Y	N	N	N
Gold membership	N	Y	N	N
Platinum membership	N	N	Y	N

Describe, in words, the criteria for eligibility for each level of membership.

Question 22 (10 marks) Use the Question 22 writing booklet.

A zoo has set up a new system which encourages members of the public to take a photo of any sighting of native moths, then upload the photo to its website, along with the date, location and number of moths. Scientists at the zoo will examine the photo and enter the data into a database if the sighting was of native moths. Scientists from different zoos can then access the data to investigate the migration habits of native moths.

- (a) How could internet and intranet technologies be used in this system? **3**
- (b) Outline technical issues that could occur for members of the public when collecting and transmitting photos. **3**
- (c) Describe wired and wireless transmission media that could be used in this system. **4**

Question 23 (9 marks) Use the Question 23 writing booklet.

An online games store is converting its flat-file database to a relational database. This table shows some of the data in its flat-file database.

<i>Game ID</i>	<i>Game name</i>	<i>Release date</i>	<i>Cost</i>	<i>Publisher ID</i>	<i>Publisher</i>	<i>Developer ID</i>	<i>Developer</i>
HB001	Ants	10/02/2018	\$29.00	P001	Abcd	D108	John Jones
HB002	Bats	21/06/2018	\$15.00	P002	DCBA	D108	John Jones
JG007	Cats	18/11/2019	\$75.00	P002	DCBA	D311	Yen Nguyen
LD118	Foxes	01/02/2020	\$68.00	P001	Abcd	D409	Sam Smith

The data stored in the flat-file database will be organised into three tables in the relational database.

- (a) Describe the benefits for the games store of converting its flat-file database to a relational database. **3**
- (b) Construct a schema to represent the three tables in the relational database, clearly identifying primary keys, foreign keys and relationships. **3**
- (c) Design a query using a structured query language (SQL) to display games that have been released from March 2018 to March 2020. List the results in alphabetical order by game name. **3**

Question 24 (11 marks) Use the Question 24 writing booklet.

Parents at a school currently order and pay for school items, such as school excursions and uniforms, at the school office or the uniform shop. The school is introducing a new information system which will allow parents to order and pay for school items using their mobile phone, and collect their order from a designated location. A text message will be sent to parents when the order is ready for collection and an electronic receipt of payment will be emailed.

- | | | |
|-----|-------------------------------------------------------------------------------------------------------------------------------|----------|
| (a) | Describe the changing nature of work for both parents and school employees as a result of the introduction of the new system. | 3 |
| (b) | How could the prototyping approach be used to develop the new system? | 3 |
| (c) | Analyse the new system in terms of the information processes of: | 5 |
| | <ul style="list-style-type: none">• processing• storing and retrieving. | |

Section III

40 marks

Attempt TWO questions from Questions 25–28

Allow about 1 hour and 10 minutes for this section

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

If you include diagrams in your answer, ensure that they are clearly labelled.

Question 25 — Transaction Processing Systems (20 marks)

Use a SEPARATE writing booklet.

- (a) Justify a situation where batch processing is appropriate. **3**
- (b) Using an example, describe how online analytical processing can be used in a transaction processing system. **3**
- (c) A screenshot of an online concert ticket booking system is shown. **4**

Concert Booking			
Concert	<input type="text"/>	▼	Customer <input type="text"/>
Venue	<input type="text"/>	▼	Credit card <input type="text"/>
Date	<input type="text"/>	▼	
No. of tickets	<input type="text"/>		<input type="button" value="Confirm"/>

Explain the importance of data validation in this booking system. Include examples of data validation methods that this system would use.

- (d) A medical centre maintains records of its patients electronically. After each patient visit, the doctor updates the patient's record. **4**

Discuss the use of the grandfather, father, son back-up procedure in this medical centre.

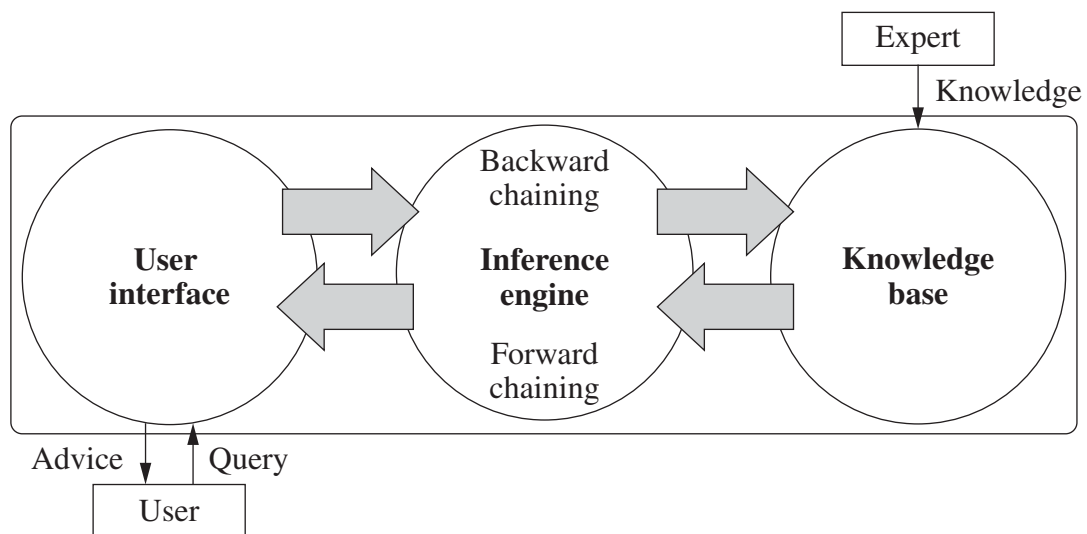
- (e) A payment system allows customers to pay in instalments when shopping online. Customers sign up through a shopping website by entering their bank account details. The shopping website provides the bank with the customer's shopping details and the bank deducts the payments from the customer's nominated account periodically. **6**

Explain why data accuracy, data security and data integrity are important in this system.

Question 26 — Decision Support Systems (20 marks)

Use a SEPARATE writing booklet.

- (a) Distinguish between a line chart and a pie chart. Include an example of each in your answer. **3**
- (b) Describe the purpose of an intelligent agent. **3**
- (c) Discuss the use of data mining in a decision support system. **4**
- (d) The diagram shows the main components of an expert system. **4**



Using the information provided on the diagram, describe how an expert system works.

Question 26 continues on page 17

Question 26 (continued)

- (e) This spreadsheet shows part of a weekly payroll system. Each employee is paid a base rate of \$26.85 per hour. Different overtime rates are paid to employees based on the hours worked in excess of 30 hours.

6

	A	B	C	D	E
1	Weekly Payroll				
2					
3	Pay Rate (\$)	26.85		Standard pay (\$)	=B3*B4
4	Standard hours per week	30			
5					
6	Emp ID	Weekly Hours	Overtime Hours	Overtime Pay Rate	Weekly Pay
7	1007	35	=IF(B7>\$B\$4, B7-\$B\$4,0)	=VLOOKUP(C7,\$B\$14:\$C\$17,2)	=\$E\$3+C7*D7
8	1065	37	=IF(B8>\$B\$4, B8-\$B\$4,0)	=VLOOKUP(C8,\$B\$14:\$C\$17,2)	=\$E\$3+C8*D8
9	2089	45	=IF(B9>\$B\$4, B9-\$B\$4,0)	=VLOOKUP(C9,\$B\$14:\$C\$17,2)	=\$E\$3+C9*D9
10	2095	30	=IF(B10>\$B\$4, B10-\$B\$4,0)	=VLOOKUP(C10,\$B\$14:\$C\$17,2)	=\$E\$3+C10*D10
11					
12	Overtime Rate Table				
13	Hours	Min	Pay Rate		
14	0	0	0		
15	1–5	1	35.35		
16	6–10	6	37.35		
17	11–15	11	42.35		

Explain how each type of formula contributes to the calculation of the weekly pay. In your answer, make specific reference to cells E3, C9, D9, E9 and B14:C17.

End of Question 26

Question 27 — Automated Manufacturing Systems (20 marks)

Use a SEPARATE writing booklet.

- (a) How can block diagrams be used to describe automated manufacturing systems? **3**
You may support your answer with diagrams.
- (b) Distinguish between *underdamping* and *overdamping*. Include an example of each. **3**
- (c) Using examples, describe how a solenoid and a hydraulic pump could be used in an automated manufacturing system. **4**
- (d) A chocolate factory is investigating whether to automate their production line. At present, the factory's staff produce small batches of chocolates by hand. After each batch is completed, the production line is manually cleaned and reconfigured in preparation for the next batch. **4**

Discuss the automation of this chocolate factory.

- (e) A warehouse is introducing a wireless Drone-RFID system to manage its stock. A drone is an aerial vehicle operated by a person. The system will use long-range RFID technology to replace its current barcode-based stock management system. The drone will be used as a relay between the RFID tags and an RFID reader. As the drone flies up and down the aisles, it will detect the RFID tags, and locate and catalogue the stock. **6**

Compare the use of the Drone-RFID system to the use of barcodes for stock management in the warehouse.

Question 28 — Multimedia Systems (20 marks)
Use a SEPARATE writing booklet.

(a) Distinguish between *morphing* and *distorting*. Include an example of each. **3**

(b) Compare TWO techniques that can be used to compress image files. **3**

(c) A school wishes to upgrade its website. The new website will have a home page that leads to a page for each faculty. The faculty pages will contain videos showing students' work. There will also be a contact page, which users can access from any page. **4**

A storyboard, containing linear, hierarchical and non-linear layouts, has been created for the new website.

Identify where an example of each storyboard layout would occur in the new website and justify your answer. You may support your answer with diagrams.

(d) A driving simulation system is being designed to assist learner drivers gain confidence when driving in different weather conditions, such as rain and fog. **4**

How might head-sets and speakers be used to enhance user experience in this system?

(e) A virtual world multimedia system is being developed for education. The system will integrate elements such as images, animation, audio and video and will allow users to interact in real time. **6**

Explain software, communication and processing technologies that have made the creation of this multimedia system possible.

End of paper

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