



NSW Education Standards Authority

2021 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 3–10)

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

Section II – 40 marks (pages 11–16)

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

Section III – 40 marks (pages 17–20)

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

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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 Which of the following is a function of a modem?

- A. Decryption of data
- B. Modulation of signals
- C. Amplification of transmission signals
- D. Correction of data transmission errors

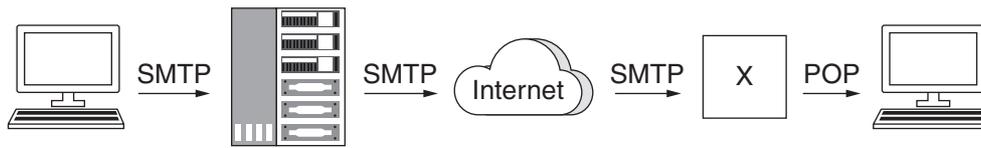
2 The Gantt chart shows the time line for developing a newsletter.

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Task 1	■	■		■	■			
Task 2	■	■			■			
Task 3		■	■	■	■	■		
Task 4					■	■	■	
Task 5								■

What is the planned duration (in weeks) of the project?

- A. 8
- B. 10
- C. 14
- D. 16

3 The diagram shows some computer devices.



What type of server is X most likely to be?

- A. Data
- B. Mail
- C. Print
- D. Web

4 Which of the following is generally used to connect a printer to a desktop computer?

- A. Infrared
- B. Optic fibre
- C. Twisted pair
- D. Coaxial cable

5 Which row of the table shows details that are usually included in an implementation plan?

A.	Funding management	Methods of conversion
B.	How to test the system	Funding management
C.	Requirements report	Participant training
D.	Participant training	How to test the system

6 A website sells fresh flowers. After a purchase is made, information about the purchase is entered into a database and distributed to a delivery driver via email.

Which combination of information processes is carried out immediately after a purchase is made?

- A. Storing and displaying
- B. Storing and transmitting
- C. Collecting and displaying
- D. Collecting and transmitting

7 A project team is developing a requirements prototype for a new system.

In which stage of the traditional system development approach would this occur?

- A. Understanding the problem
- B. Planning
- C. Designing
- D. Implementation

8 In a free text search, the symbols ? and * are used to replace characters in a word.

Using the search query ?O*, which word could be found?

- A. NETWORK
- B. OPTICAL
- C. RADIO
- D. TOPICS

9 A shopping website crashed on the first day of a sales promotion while customers tried to access the website.

Which type of testing would have prevented the website from crashing?

- A. Live data
- B. System data
- C. Volume data
- D. Simulating data

10 A gateway in a communication system is used to

- A. encrypt data for transmission between networks.
- B. strengthen signals for transmission between networks.
- C. connect networks with different transmission protocols.
- D. connect networks with the same transmission protocols.

Use the following information to answer Questions 11 and 12.

A student is converting a movie flat-file database to a relational database. The following diagram shows two possible tables in the database.

Movie	Director
MovieID (primary key) MovieTitle ReleaseDate DirectorID (foreign key)	DirectorID (primary key) LastName FirstName

- 11** What is a main purpose of the DirectorID key in the Movie table?
- A. To link the Movie and Director tables
 - B. To provide another unique key for searching
 - C. To allow local and foreign movies to be stored
 - D. To create a unique identifier for the Movie table
- 12** Which of the following describes the relationship between the Movie table and the Director table?
- A. One to one
 - B. One to many
 - C. Many to one
 - D. Many to many
- 13** In which row of the table do all of the functions relate to network operating software?

A.	Assigning transmission protocols	Controlling file access	Printer maintenance
B.	Supporting workstations	Application sharing	Controlling printer access
C.	Keyboard maintenance	Network address allocation	Supporting workstations
D.	Printer maintenance	User management	Network address allocation

- 14** Which of the following would occur at the transmission level of a communication system framework?
- A. Composing an email to a friend
 - B. Updating from 3G to 4G technology
 - C. Watching a movie from a streaming site
 - D. Sending an image between two mobile devices

- 15** A consultant is given a short time frame to develop a new system for a business. However, the clients do not have the expertise or the time to assist with the development.

Which system development approach would be most effective?

- A. Agile
- B. Participant
- C. Prototyping
- D. Traditional

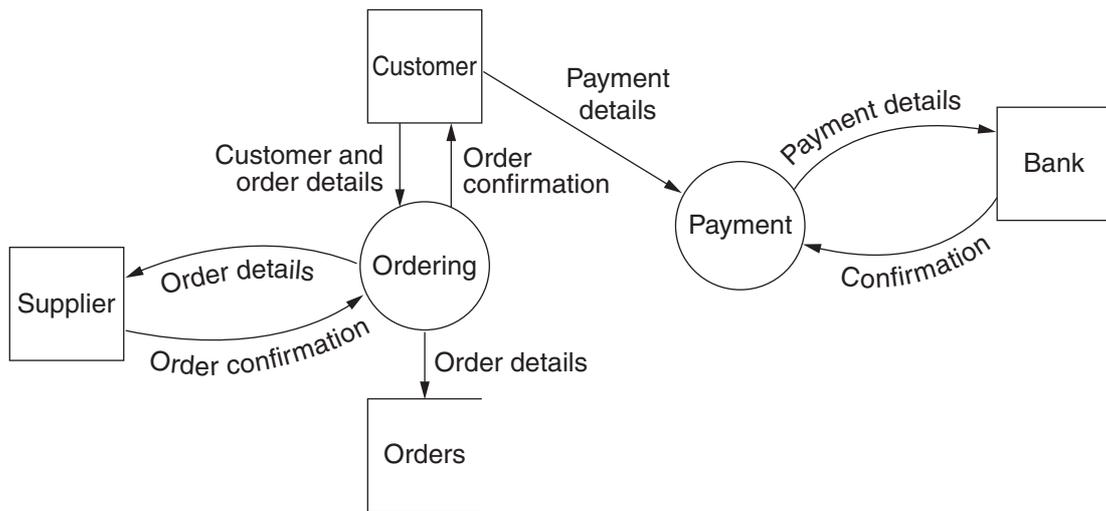
- 16** The following table shows three data bytes sent between two devices.

<i>Sender</i>	<i>Receiver</i>
01010010	01011110
01001001	01101001
01010100	01000010

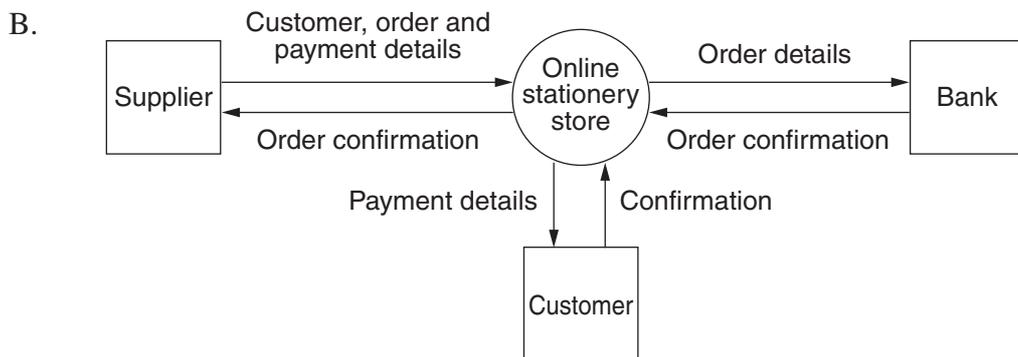
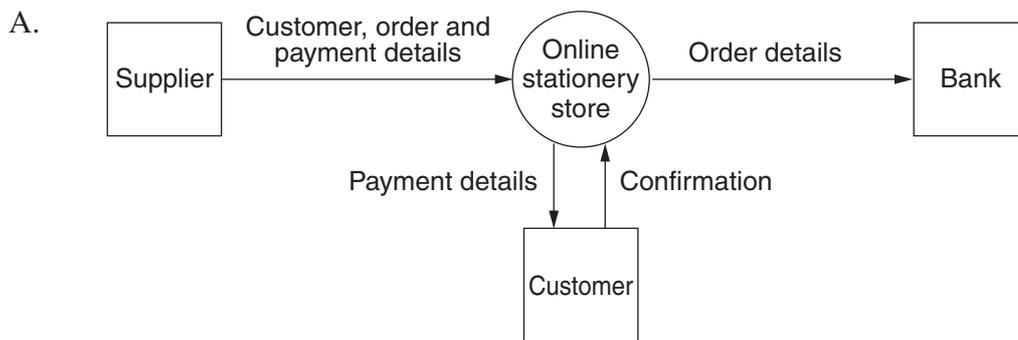
Which parity was used, and how many data bytes were detected as having been transmitted incorrectly?

	<i>Parity</i>	<i>Number of data bytes detected as transmitted incorrectly</i>
A.	Even	2
B.	Even	3
C.	Odd	2
D.	Odd	3

17 This data flow diagram is used in an online system for a stationery store.



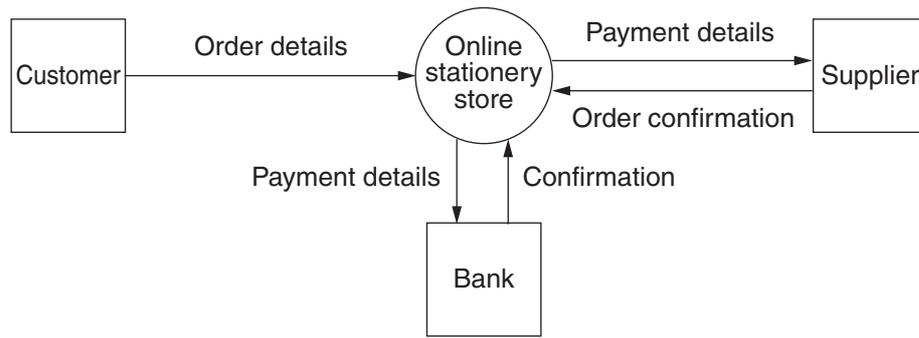
Which of the following best represents the context diagram for this system?



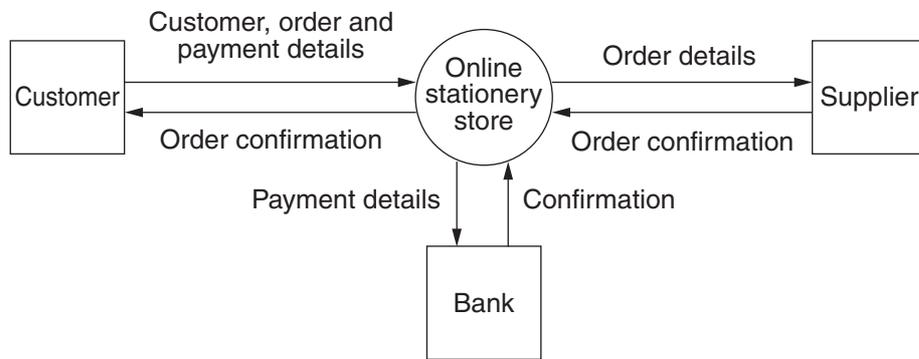
Question 17 continues on page 9

Question 17 (continued)

C.



D.



End of Question 17

- 18 Which row of the table correctly identifies the activities for testing, evaluating and maintaining an information system?

	<i>Testing</i>	<i>Evaluating</i>	<i>Maintaining</i>
A.	Modify the system when problems are identified	Trial the operation manual	Trial system using data
B.	Update system documentation	Review the effect on users and participants	Trial the operation manual
C.	Trial system using data	Check if the requirements are met	Update system documentation
D.	Participant testing of data	Update user documentation	Modify the system when problems are identified

- 19 In which row of the table do all of the features relate to data transmission using the *Ethernet* protocol?

A.	Data traffic is checked before sending	CSMA/CD regulates communication	Only one node can send data at a time
B.	Only one node can send data at a time	Token regulates communication	Data traffic is checked before sending
C.	A free token is needed before sending	Data is attached to token for transmission	CSMA/CD regulates communication
D.	Data is attached to token for transmission	A free token is needed before sending	Token regulates communication

- 20 The contents of four text fields are 34, 17, 6 and 20.

Which of the following shows the output after an ascending text sort is performed?

- A. 6, 17, 20, 34
- B. 17, 20, 34, 6
- C. 17, 6, 34, 20
- D. 34, 20, 17, 6

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.

Please turn over

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

- (a) What is *data redundancy* in a database? Include an example in your answer. **2**
- (b) A database is to be developed to manage a graduation dinner. Students will be able to invite guests to the dinner.

The data dictionary for the booking table is shown. Some information about the fields is missing.

<i>Field name</i>	<i>Data type</i>	<i>Field size</i>	<i>Description</i>
Student_ID	Number	5	
First_Name	Text	25	
Last_Name	Text	25	
Phone_Number			Student's mobile number eg 0499123456
No_of_guests	Number	1	
Deposit_Paid			Shows whether a deposit has been paid

- (i) Copy the table below into your writing booklet. **3**

In your table, recommend an appropriate data type and field size for Phone_Number and Deposit_Paid, and justify each choice of data type.

<i>Field name</i>	<i>Data type</i>	<i>Field size</i>	<i>Justification for choice of data type</i>
Phone_Number			
Deposit_Paid			

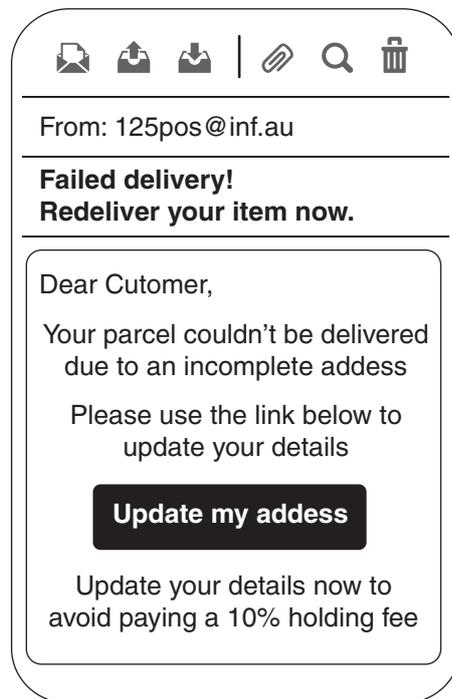
- (ii) If there are 200 records, show how the size of the booking table (in megabytes) can be calculated. **2**
- (iii) Write a SQL statement to list the names in alphabetical order (A–Z) by Last_Name of the students who have more than one guest. Use the following keywords in your answer. **3**

SELECT
FROM
WHERE
ORDER BY

Question 22 (11 marks) Use the Question 22 writing booklet.

- (a) A person has received the following email about a failed delivery.

2



Give TWO reasons why this email could be considered suspicious.

- (b) An events management business is introducing a new customer check-in system. Customers have to enter their name, mobile number and email address before entering any event.

3

Describe issues related to the use of the system.

- (c) Using examples, describe how *phased* and *pilot* conversions differ.

3

Question 22 continues on page 14

Question 22 (continued)

(d) This table shows internet plans available from a telecommunications business.

3

<i>Internet plan</i>	<i>Speed</i>	<i>Monthly data</i>	<i>Cost per month</i>
Broadband	25 Mbps	Unlimited	\$49.90
Broadband	50 Mbps	500 Gb	\$75.00
Broadband	50 Mbps	Unlimited	\$80.00
Broadband and phone	25 Mbps	250 Gb	\$65.00
Broadband and phone	50 Mbps	Unlimited	\$85.00

Draw a decision tree showing the rules to determine the monthly cost for a customer.

End of Question 22

Question 23 (10 marks) Use the Question 23 writing booklet.

- (a) A small business is planning a new network. It has a choice of a star or ring topology. **3**

Discuss the use of each topology for this network.

- (b) Compare microwave and satellite transmission of data. **3**

- (c) A bank is introducing a new system to allow its staff to work from home and for its customers to have greater access to online banking features. **4**

Describe how internet, intranet and extranet technologies can be used in this system.

Please turn over

Question 24 (9 marks) Use the Question 24 writing booklet.

A new system is to be developed which will allow patients to access health providers online via video-conferencing software. The health providers will access the patient's medical records from a national database and update the records after each consultation. Each consultation is recorded and uploaded into the database. This system needs to be implemented within six months.

- (a) Describe what should be considered when assessing the feasibility of developing the new system. **4**
- (b) Describe the system in terms of: **5**
- users and participants
 - data and information
 - the information process of *displaying*.

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 real time processing is essential. **3**

(b) A shoe store needs to backup its sales data daily. **3**

Describe TWO forms of storage media suitable for backing up this system.

(c) A business wishes to collect customer feedback online. The following is required: **4**

- age range (16–25, 26–35 or 36–45)
- customer satisfaction (a ranking out of 5)
- a choice of three services that the customer is likely to use from a list of five services
- a general comment.

Design a screen for collecting these data. Clearly label all design features.

(d) A library uses a radio frequency identification (RFID) system. A book's RFID tag is scanned when it is borrowed or returned. The transaction details are recorded in a database. **4**

Discuss the use of RFID tags to keep track of books in this library.

(e) A department store uses a transaction processing system to keep track of its sales. These transactions are analysed monthly. **6**

Explain how the use of data warehousing would benefit this department store.

Question 26 — Decision Support Systems (20 marks)

Use a SEPARATE writing booklet.

(a) Describe how *what-if* models can be used to support decision making. **3**

(b) Distinguish between *semistructured* and *unstructured* decision support systems. Include an example of each in your answer. **3**

(c) A company has offices in different locations throughout Australia. The office managers meet in person four times a year to discuss business strategies. **4**

Describe the advantages and disadvantages of using a group decision support system for these meetings.

(d) Explain how a geographic information system (GIS) supports decision making. Include an example in your answer. **4**

(e) A system is to be developed to use drones to navigate different street routes to deliver packages without human intervention. To develop the system and flying commands for the drones, driving patterns of delivery drivers and captured images of motor vehicles approaching obstacles will be used. **6**

Is an expert system or a neural network more suitable for developing this system? Justify your answer with reference to both methods.

Question 27 — Automated Manufacturing Systems (20 marks)

Use a SEPARATE writing booklet.

- (a) Describe how discrete processing can be used in an automated manufacturing system. Include an example in your answer. **3**

- (b) Using an example, distinguish between CAD and CAM. **3**

- (c) Justify situations where the use of automated manufacturing systems would be beneficial. **4**

- (d) Define *noise* in an automated manufacturing system and the techniques for reducing it. **4**

- (e) A robotic system is being designed to enhance safety and stock management in supermarkets. Robots will move around the stores and alert staff of identified hazards. They also have the ability to clean up water spills and alert staff to restock if empty shelves are detected. **6**

Explain the technologies required for this system to operate.

Please turn over

Question 28 — Multimedia Systems (20 marks)

Use a SEPARATE writing booklet.

- (a) Describe how virtual reality can be used in entertainment. **3**
- (b) Distinguish between the software required for video processing and for animation. Include an example of each. **3**
- (c) Explain how the sampling rate affects the size of an audio file. **4**
- (d) A home appliance manufacturer is developing a mobile touch-screen that will give users remote control over appliances such as air conditioners, lights and robotic vacuum cleaners. **4**

The touch-screen system uses multimedia formats such as images, audio, text and videos in the display.

Describe the fields of expertise required to develop this system.

- (e) A multimedia system is to be developed which will allow users to upload television and radio programs, podcasts, movies and music to share with other users. **6**

Analyse this multimedia system in terms of technical and ethical issues and the information process of *storing* and *retrieving*.

End of paper