



NSW Education Standards Authority

**2019** 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 2–9)

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

**Section II – 40 marks** (pages 10–13)

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

**Section III – 40 marks** (pages 14–17)

- 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** Which of the following shows the logical organisation of data in a flat-file database?
- A. Character → field → record → file
  - B. Record → field → character → file
  - C. Record → file → character → field
  - D. Character → file → record → field
- 2** A project manager records the progress and completion of tasks during the development of an information system.
- Which project management tool is being used?
- A. Scheduling of tasks
  - B. Journals and diaries
  - C. Time management plan
  - D. Communication management plan
- 3** Which type of wired transmission medium has a core of refined glass?
- A. Optic fibre
  - B. Coaxial cable
  - C. Shielded twisted pair
  - D. Unshielded twisted pair

- 4 Which row of the table correctly shows an analogue signal and a digital signal?

	<i>Analogue</i>	<i>Digital</i>
A.		
B.		
C.		
D.		

- 5 A user is creating a new login for an online account.

<b>USER NAME</b>	<input type="text" value="IPT.COURSE"/>
<b>PASSWORD</b>	<input type="password" value="*****"/>
<b>CONFIRM PASSWORD</b>	<input type="password" value="*****"/>

What issue is being addressed by the requirement to enter the password twice?

- A. Data security
- B. Data accuracy
- C. Data matching
- D. Data redundancy

- 6 A data dictionary for a table within a mobile phone retailer's relational database is shown.

<i>Field Name</i>	<i>Type</i>	<i>Size</i>	<i>Description</i>
Phone_ID	Text	10	Phone identification code
Date of Purchase	Date	8	Purchase date of phone
Staff_ID	Text	5	Staff identification code
Price	Currency	4	Cost in dollars

Which calculation will determine the approximate size (in kilobytes) of the data stored in the table if there are 512 records?

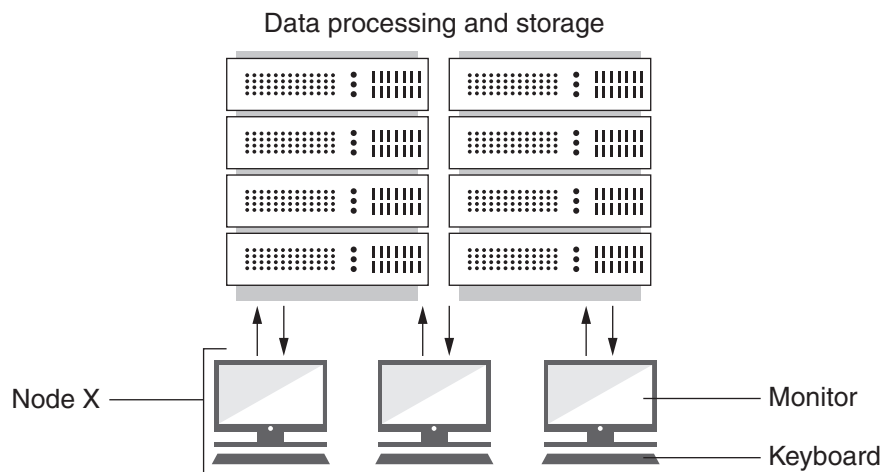
- A.  $\frac{(10 + 8 + 5 + 4)}{1024}$
- B.  $\frac{(10 + 8 + 5 + 4) * 512}{(8 * 1024)}$
- C.  $\frac{(10 + 8 + 5 + 4) * 1024}{512}$
- D.  $\frac{(10 + 8 + 5 + 4) * 512}{1024}$
- 7 Which process begins when one device sends a message to another device indicating that it wants to establish a communication link?
- A. Handshaking
- B. Synchronisation
- C. Message creation
- D. Addressing and routing

- 8 Which row of the table correctly describes a feature of the internet, an intranet and an extranet?

	<i>Internet</i>	<i>Intranet</i>	<i>Extranet</i>
A.	A global system of interconnected computer networks	Information can be shared securely between employees and external people	Owned by a particular organisation
B.	Data and information can be shared across the world	Public network	Owned by the participants within an organisation
C.	Public network	Owned by a particular organisation	Information can be shared securely between employees and external people
D.	Owned by the participants within an organisation	Only authorised users can access the organisation's data	Private network

- 9 In which level of the communication system framework does the physical transfer of data between nodes occur?
- A. Addressing
  - B. Application
  - C. Communication
  - D. Transmission

- 10 What is the purpose of an operation manual?
- To provide technical specifications of a system
  - To obtain feedback about the operation of an information system
  - To help participants understand the purpose of an information system
  - To describe procedures the participants need to follow when operating a system
- 11 The diagram represents a library search system.



What type of device is node X?

- Fat client
  - Thin client
  - File server
  - Mail server
- 12 The table shows transmission of data bytes. Each data byte is made up of a seven-bit character and a parity bit.

For which row of the table would the receiver request the data byte to be resent?

	<i>Sent</i>	<i>Received</i>
A.	11001010	01010010
B.	01010010	00010110
C.	11111111	00000000
D.	01100101	01100101

**13** Which of the following would locate the words 'broadband' and 'bandwidth' in a free text search?

- A. \*band?
- B. ?band\*
- C. \*band\*
- D. ?band?

**14** A pair of protocols is used to connect network devices on the internet and provide sender to receiver communication that specifies how data is packetised, transmitted, routed and received at the destination.

Which pair of protocols is being described?

- A. TCP and IP
- B. HTTP and IP
- C. TCP and SMTP
- D. HTTP and SMTP

**15** A sort on the age field in a database produces the following output.

10 15 2 26

This is an example of

- A. a descending sort on a text field.
- B. an ascending sort on a text field.
- C. a descending sort on a numeric field.
- D. an ascending sort on a numeric field.

**16** When transmitting over a network, data is broken into data packets to

- A. remove transmission errors.
- B. comply with all network protocols.
- C. minimise data loss due to network interference.
- D. ensure data is received in a timely manner using different routes.

- 17** A requirements prototype is built during the development of a new system.

What is the role of the requirements prototype?

- A. To simplify the system for participant training
- B. To compare the new system with the old system
- C. To understand the essential features of the system
- D. To determine the technology requirements of the system

- 18** Which row of the table shows details that are commonly included in a requirements report?

A.	Information technology	Users' feedback	Data and information
B.	Needs of users	Data and information	Subprojects
C.	Needs of users	Economic feasibility	Subprojects
D.	Information technology	Users' feedback	Economic feasibility

- 19** A bicycle sharing business wants to print a report showing all customers who hired a bicycle in October 2019.

Which of the following contains the correct SQL criteria to obtain this information?

- A. (Hire\_Date = '01/10/2019') OR (Hire\_Date > '31/10/2019')
- B. (Hire\_Date >= '01/10/2019') OR (Hire\_Date <= '31/10/2019')
- C. (Hire\_Date = '01/10/2019') AND (Hire\_Date < '31/10/2019')
- D. (Hire\_Date >= '01/10/2019') AND (Hire\_Date <= '31/10/2019')



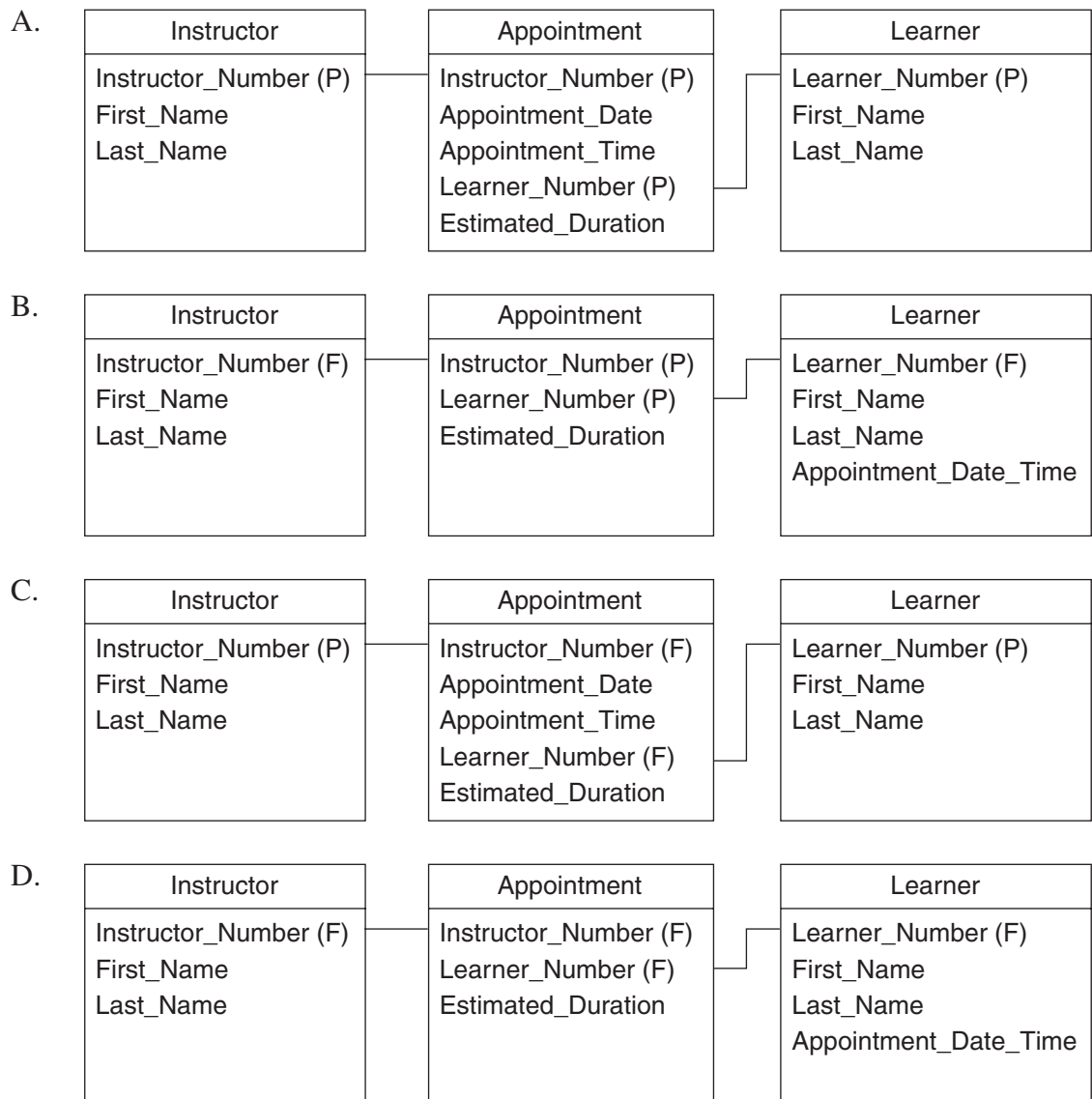
- 20 A driving school has the following appointment information.

<i>Instructor number</i>	<i>Instructor name</i>	<i>Learner number</i>	<i>Learner name</i>	<i>Appointment date and time</i>	<i>Estimated duration</i>
PS01	Kim Pine	P001	Clare Wayne	1/05/2019 9:30 am	40 minutes
PS01	Kim Pine	P002	Bill Nguyen	6/05/2019 11:15 am	30 minutes
PS02	Lech Huon	P0106	Omar Ibrahim	29/05/2019 1:45 pm	30 minutes
PS02	Lech Huon	P001	Clare Wayne	4/06/2019 2:00 pm	1 hour
PS01	Kim Pine	P001	Clare Wayne	18/06/2019 10:00 am	1 hour

The business is moving its data to a relational database.

Which of the following diagrams shows the structure of the database in its third normal form?

KEY: (P) = Primary key, (F) = Foreign key



## 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.

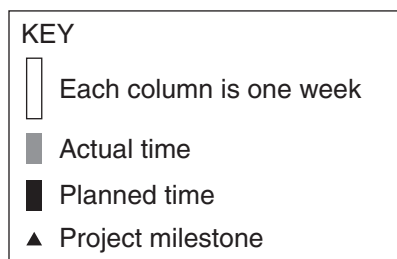
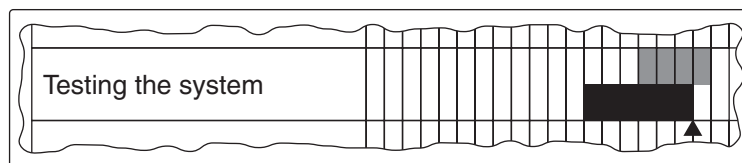
---

**Question 21** (9 marks) Use the Question 21 writing booklet.

A government is developing an electronic driver licence system to replace its current plastic licence. Several urban and rural locations have been selected to trial the new system ahead of the countrywide rollout. The new system will allow drivers to retrieve, update and display their licence details on a range of electronic devices. Drivers will still be required to carry their current plastic driver licence during the trial period.

- (a) The diagram shows a portion of the Gantt chart for this project.

**2**



Describe the progress of the ‘testing the system’ task.

- (b) Which conversion method is being used in the scenario? Justify your answer. **3**
- (c) Explain why a user of the new system can also be considered a participant in the system. **2**
- (d) Outline how cyclic redundancy check (CRC) can be used in this system. **2**

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

A gym wants to develop a mobile app to automate customer payments and gym class bookings. The owner requires the app to be active in six months, be easy to use and to work with the gym's existing payment and booking programs.

As a promotion, the gym is introducing a one-off 25% discount on membership for new customers and a 10% discount for existing members. To qualify for the discount, the customer must live in the area and sign up for a 12-month subscription for use of the app.

- (a) Describe risks that should be considered in the feasibility study of this project. **3**
- (b) Draw a decision tree showing the rules to determine a member's discount. **3**
- (c) Explain how the gym can keep its members' data secure. In your answer, consider hardware, software and communication systems. **4**

**Please turn over**

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

A city conducts a census every four years to determine the population and to obtain details such as people's ages, addresses, incomes and jobs. Due to its population of over six million, the city arranges to collect its census data via an online information system rather than on paper. Every resident in the city is asked to log on to a website on the census date to complete a series of questions online.

- (a) Describe the advantages to the city of conducting the census online rather than on paper. **3**
- (b) Explain why it is important for the website to be tested prior to its launch. **3**
- (c) Describe the requirements of the system in terms of storing and retrieving, and analysing. **4**

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

A bus company is implementing an information system that allows customers to make bookings online using a mobile phone. To use the system, customers are required to create an account and set up an automated method of payment. To make a booking, a customer selects their pick-up location, preferred pick-up time, destination and number of passengers.

The bus company's central computer collects location data from the bus's global positioning system to work out the route required for the bus to pick up the customer.

When a booking is confirmed, the bus company's central computer sends a text confirming the booking, a boarding pass and an approximate pick-up time to the customer's mobile phone.

- |     |   |          |
|-----|---|----------|
| (a) | Design a booking screen for the information system. Label all features clearly. | <b>3</b> |
| (b) | Describe how wireless transmission is used in this situation.                   | <b>3</b> |
| (c) | Draw a data flow diagram to represent this information system.                  | <b>5</b> |

**Please turn over**

## 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) Define *bias* in data collection. Support your answer with an example. **3**
  
- (b) Distinguish between OLAP (Online Analytical Processing) and OLTP (Online Transaction Processing). **3**
  
- (c) Compare batch processing and real-time processing in terms of their advantages and disadvantages. Include an example of each in your answer. **4**
  
- (d) A rental agency maintains records of properties that it manages for its customers. The agency performs a nightly partial backup and a weekly full backup of its data. **4**

Explain the benefits to the rental agency of using a combination of partial backup and full backup.

- (e) A supermarket is implementing a shop, scan and go payment system. A customer will select the items required and use their mobile device to scan the items' barcodes before placing the items into their shopping basket. When the customer presses the 'finish shopping' button, they are directed to pay online and the list of purchased items will appear on their mobile phone. **6**

Discuss issues that could arise from the implementation of this system.

**Question 26 — Decision Support Systems (20 marks)**

Use a SEPARATE writing booklet.

- (a) Describe how a management information system can be used to support decision making. **3**

- (b) Distinguish between a *formula* and a *function* in a spreadsheet. In your answer, include an example of each. **3**

- (c) A fatigue warning system monitors drivers' behaviour to identify any signs that a driver is losing concentration while driving. The system's infra-red camera monitors the driver for eyelid closure, facial and head movement and illegal behaviour such as mobile phone use. The system will alert the driver if there is a change in the driving pattern. **4**

Explain why the fatigue warning system is likely to be an example of a neural network and NOT an expert system.

- (d) To assist with decision making, staff in an emergency services department use a 3D flood modelling system to visually represent what might happen in the case of a flood. The system collects information about urban infrastructure, such as stormwater drains, population and weather forecast data, enabling emergency managers to alert communities to prepare for extensive flooding. **4**

Explain the responsibilities of the staff when using this decision support system.

- (e) A bank is launching several new financial products such as saving accounts, credit cards and loans. The bank wants to analyse its customers' banking history in order to determine which of the new products to offer them. **6**

Explain how the use of a data warehouse and data mining could assist with decision making in this situation.

**Question 27 — Automated Manufacturing Systems (20 marks)**

Use a SEPARATE writing booklet.

- (a) Describe the purpose of production scheduling in an automated manufacturing system. **3**
- (b) Distinguish between *batch* and *continuous* processing systems. In your answer, include an example of each. **3**
- (c) Discuss the use of rapid prototyping in automated manufacturing systems. **4**
- (d) A dental technician uses CAD, CAM and CNC systems to make dental restorations including braces, dental implants and dentures (false teeth). **4**

Describe the relationship between CAD, CAM and CNC in this situation.

- (e) A company operates an online clothing store. Orders placed by customers online are stored in a centralised database. At the automated warehouse, the order is processed using technologies to locate, pack and post the products ordered to the customer. **6**

Explain how technologies can be used within the automated warehouse to complete an online order. In your answer consider sensors and actuators.



**Question 28 — Multimedia Systems (20 marks)**

Use a SEPARATE writing booklet.

- (a) Describe how multimedia systems can be used in education and training. Include an example in your answer. **3**
- (b) Distinguish between *hierarchical* and *linear* storyboards. Support your answer with diagrams. **3**
- (c) Explain how advances in processing power have affected the development of multimedia systems. **4**
- (d) A restaurant is developing a new touch-screen ordering system. The system will allow customers to view food items and prices and place orders. Customers place orders by selecting the required food item and quantity and submitting the order. **4**

Describe the fields of expertise required to develop this system.

- (e) A producer is developing a multimedia presentation about holiday destinations which will be uploaded to the internet. The presentation will integrate multimedia elements such as images, animation, audio and video. **6**

Recommend and justify appropriate file formats for images, animation, audio and video in this multimedia presentation.

**End of paper**

BLANK PAGE

BLANK PAGE

BLANK PAGE