

CANDIDATE
NAME

CENTRE
NUMBER

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NUMBER

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COMPUTING

9691/13

Paper 1

October/November 2015

1 hour 30 minutes

Candidates answer on the Question Paper.

No additional materials are required.

No calculators allowed.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

No marks will be awarded for using brand names of software packages or hardware.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **15** printed pages and **1** blank page.

1 (a) A supermarket uses barcodes on all its products.

Name **two** input devices and **two** output devices you would expect to see at the supermarket checkout. Give a reason for your choice in each case.

Input device 1

Reason for choice

.....

.....

Input device 2

Reason for choice

.....

.....

Output device 1

Reason for choice

.....

.....

Output device 2

Reason for choice

.....

..... [4]

(b) The supermarket daily sales data are stored on the hard disk of a computer. The data are printed out at the end of the day.

Explain how a buffer and an interrupt are used when printing the data.

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..... [4]

2 The following utility software is regularly used by a student on their stand-alone computer.

Give a reason why each item of utility software was installed on their computer.
Describe the purpose of each item of utility software.

(i) Disk formatter

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.....
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..... [3]

(ii) Printer driver

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..... [3]

(iii) Virus checker (anti-virus software)

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..... [3]

3 Six statements and eight computing terms are shown below.

Draw a line from each statement to its correct computing term.

Statement

Computing term

Data transmission in which all the bits are sent simultaneously using a communications path for each bit

Broadband

Uni-directional communication where data are sent in the form of analogue signals; this system allows multiple transmissions at the same time

Data compression

A method of checking for the successful transmission of a sequence of bits

Circuit switching

Encoding of data to take up less storage space and therefore use less bandwidth when carrying out data transmission

Baseband

Bi-directional communication where data are sent as digital signals; the communication uses a single channel which utilises the entire bandwidth of the media

Parallel

Protocol

Set of rules or instructions to govern the transmission or exchange of data

Parity

Packet switching

[6]

4 Sensors are used to monitor pollution levels in a water reservoir that supplies drinking water to a city.

(a) Put a tick (✓) next to each sensor which could be used in this monitoring process.

Sensor	Suitable (✓)
motion	
oxygen	
acidity (pH)	
pressure	
humidity	

[2]

(b) Data from the sensors are sent every minute to a computer 20 km away.

A dedicated line is used for this purpose.

(i) Describe **two** benefits of using a dedicated line.

.....

.....

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..... [2]

(ii) The data are sent using serial, full duplex data transmission.

Describe what is meant by the **two** terms:

Serial

.....

.....

.....

Full duplex

.....

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..... [4]

(iii) Explain how the sensor data could be used to monitor the drinking water pollution levels. Include in your answer, how warnings of unacceptable pollution levels are given.

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..... [4]

5 A company wishes to connect their computers using a local area network (LAN).

(a) Compare the following three network topologies by describing **one** benefit and **one** drawback of each topology.

Bus

Benefit
.....
.....

Drawback
.....
.....

Star

Benefit
.....
.....

Drawback
.....
.....

Ring

Benefit

.....

.....

Drawback

.....

..... [6]

(b) Name and describe **four** items of hardware which will be found on the company's LAN.

1

.....

.....

2

.....

.....

3

.....

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4

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..... [4]

- 6 A safety system monitors three parameters T, P and V. These parameters form the input to a logic circuit and have the binary values 0 or 1.

The following table summarises the conditions represented by each of the three parameters.

Parameter	Description	Binary value	Conditions
T	temperature	0	temperature < 150°C
		1	temperature \geq 150°C
P	pressure	0	pressure < 10 bar
		1	pressure \geq 10 bar
V	volume	0	volume < 50 m ³
		1	volume \geq 50 m ³

The logic circuit has an output value of X.

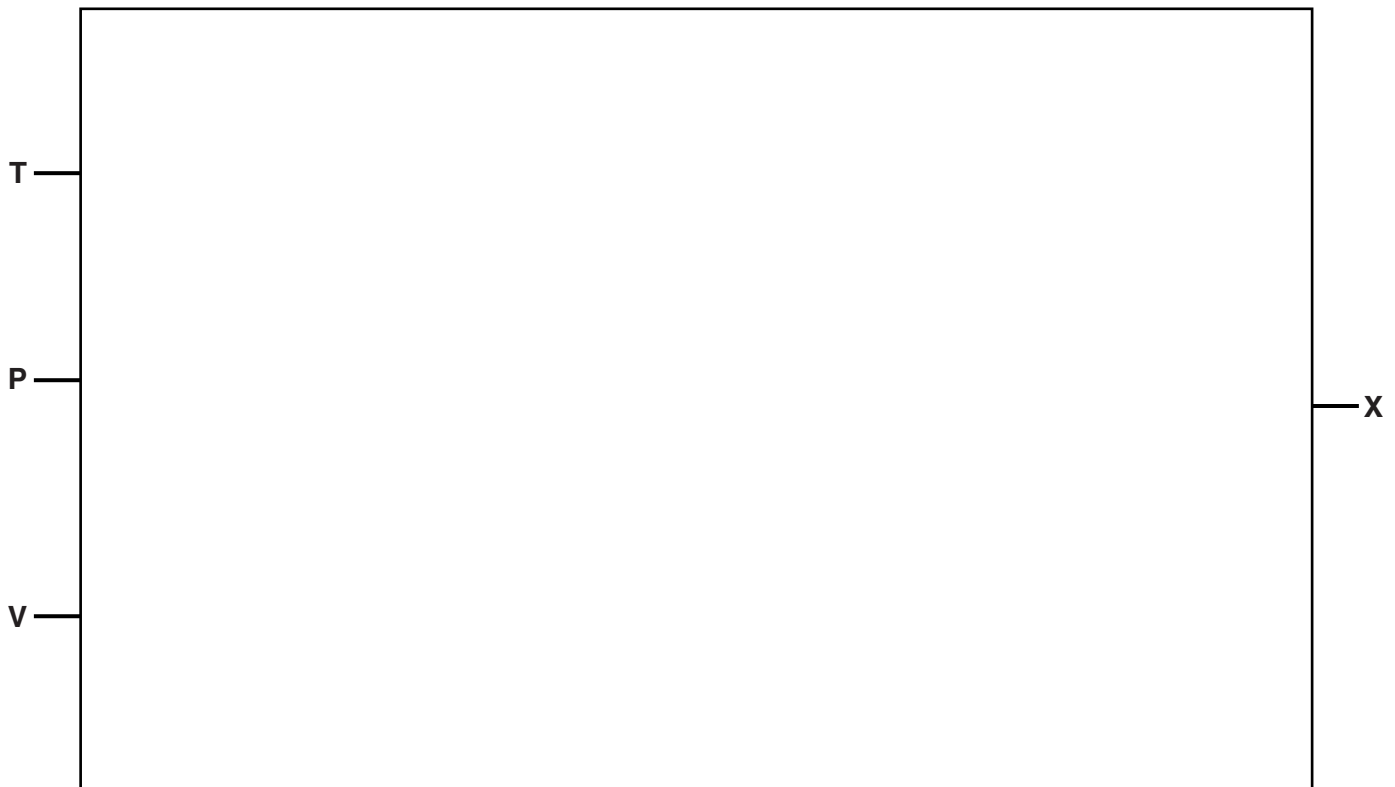
X will have the value 1 if:

temperature \geq 150°C and pressure < 10 bar

or

temperature < 150°C and (volume < 50 m³ or pressure \geq 10 bar)

- (a) Draw a logic circuit to represent the above safety system.



[4]

(b) Complete the truth table for the safety system.

Input			Working space	Output X
T	P	V		
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

7 (a) A train travels along a 300 km track. Its speed is computer-controlled.

At each one kilometre interval:

- the speed of the train is captured
- the speed is checked against a stored value for that section of track
- if the train is travelling too quickly, brakes are applied
- if the train is travelling too slowly, an accelerator is applied

The three variables used by the computer program are:

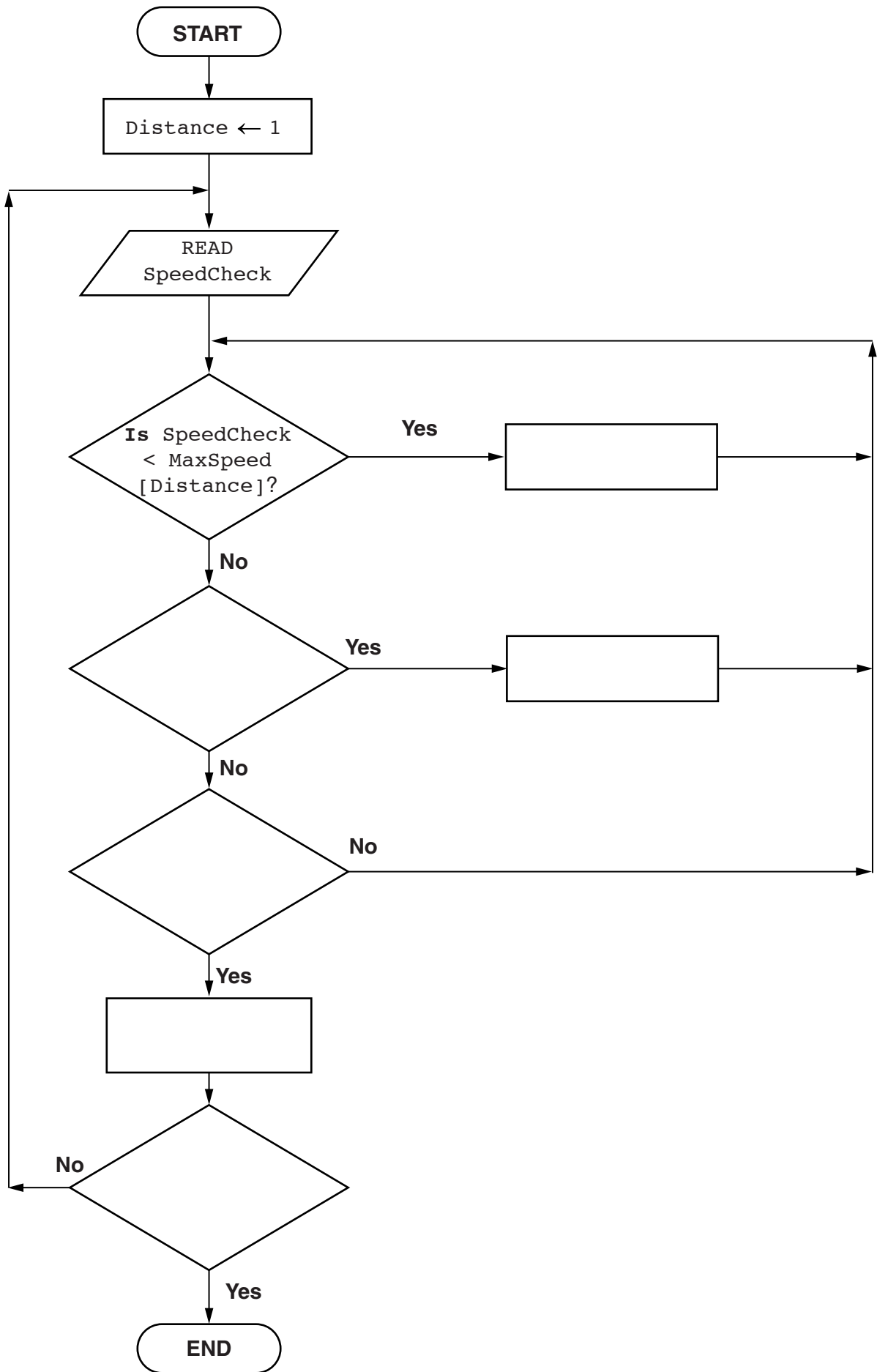
Identifier	Description
SpeedCheck	Input speed of train
MaxSpeed	An array of stored critical values
Distance	Distance travelled from start

The flowchart opposite, shows the initial design of the computer-control program.

Six of the statements are missing from the flowchart.

Complete the flowchart, using **only** statement numbers.

Statement number	Statement
1	Is SpeedCheck > MaxSpeed[Distance]?
2	Distance ← Distance + 1
3	Signal is sent to accelerate train
4	Is Distance = 300?
5	Signal is sent to brake train
6	Is SpeedCheck = MaxSpeed[Distance]?



(b) A working computer system is produced using the flowchart.

Name and describe **three** of the system life cycle stages, other than maintenance, that follow the design stage.

1

Description

.....

2

Description

.....

3

Description

..... [3]

(c) The computer system has been operating for a few months.

It must undergo adaptive maintenance to meet new railway legislation.

State **two** other types of maintenance that may be required in the future by this system. For each, describe a situation that would make this type of maintenance necessary.

Type 1

Situation

.....

.....

Type 2

Situation

.....

..... [4]

- (d) Two 8-bit memory registers are used to store the current values of **SpeedCheck** and **MaxSpeed[Distance]**.

The value for **SpeedCheck** is stored in register A.

The value for **MaxSpeed[Distance]** is stored in register B.

- (i) State the positive denary values for the registers shown:

A	1	0	0	1	1	1	1	0
----------	----------	----------	----------	----------	----------	----------	----------	----------

B	0	1	0	1	0	1	0	1
----------	----------	----------	----------	----------	----------	----------	----------	----------

A

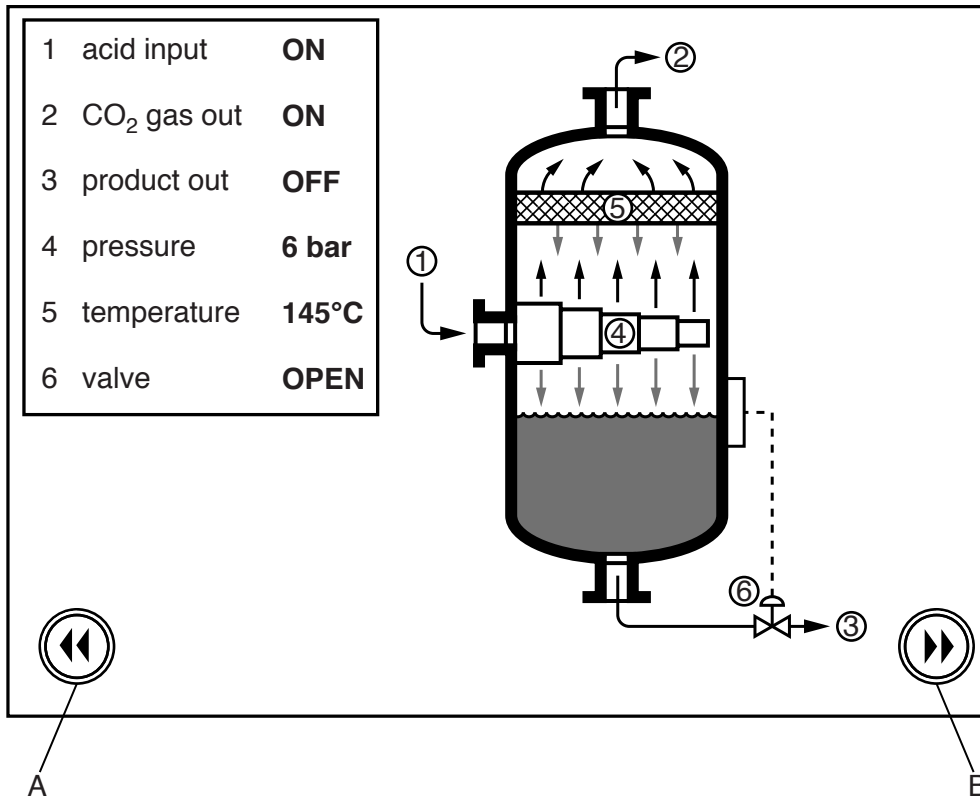
B [2]

- (ii) Show how a speed of 180 kilometres per hour (km/h) would be stored in register B.

B								
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[1]

8 In a chemical plant, operators work in a control room. They monitor processes and can then make changes when necessary. The control room has the following screen.



(a) (i) State the purpose of graphics A and B.

.....
 [1]

(ii) The state of the valve, labelled 6, is displayed currently with the word OPEN.

Alternatively, how could graphics be used to show the state of the valve?

.....

 [2]

(iii) The pressure value is always in the range 0 to 20 bar.

Describe how this value for the pressure could be displayed as a graphic.

.....

 [2]

(b) Explain why a mouse is not a suitable interface device in the control room.

.....
.....
.....
..... [2]

(c) The chemical processes are computer-controlled. The operators can intervene if necessary.

Give **two** reasons why computer control is safer than manual control.

1
.....
2
..... [2]

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