Booklet 1 – answers and hints

1(a) The features found in a typical CAD package include:

- wire frame
- 2D and 3D modelling
- library of parts which can be used in new drawings
- validation and verification of designs against original specification
- ability to link with computer-aided manufacture (CAM)
- facility to calculate the mass of the actual object once built
- facility to calculate the cost of producing the article
- features such as rotation, colour, zoom, etc.
- simulation of designs without the need to build a prototype
- create engineering drawings from solid models
- import and export to allow the exchange of data with other software packages
- kinematics (i.e. check moving parts in assemblies don't interfere with each other)
- routing of cables and hoses

(b) Any of the following advantages could be quoted:

- easier to modify drawings of the toy
- toy can be built up from library of parts
- possible to cost final toy automatically
- easy to try colour variations etc.

2(a) Definition points:

- artificial 3D environment …..
- ….. created by a computer
- users wear data goggles, data helmets, data gloves or suits fitted with sensors
- devices monitor user actions (e.g. data goggles track eye movement and system responds by sending new video input)

(b) (i) Stages in the creation of images

- takes photos with a digital camera
- photos taken from a single, reference point
- camera rotated around the room as a number of photos taken
- images "stitched" together using imaging software
- photo images re-sized and re-configured for Internet use

(ii) Expected features:

- hot spots on web page to allow user to move around the hotel
- plans and maps integrated to allow user to navigate the hotel
- ability to move from room to room to navigate whole hotel

(c) There are many applications; examples include:

- special effects on films/television
- arcade games
- training (military, medical, etc.)
- design (e.g. nuclear and chemical plants

3(a) Interaction between sensors and microprocessor:

- sensors around the house would gather information
- e.g. has a light beam been broken
- has pressure pad detected excess pressure
- has infra red beam detected excess heat
- has acoustic sensor detected any noise such as breaking glass
- data translated into digital using an ADC (analogue to digital converter)
- microprocessor/computer will compare signal from sensor with stored info
- e.g. signal that light beam is broken
  pressure > stored "normal" value
  heat level > stored "normal" value
  acoustic level > "stored" normal value
- if any values are outside normal range, microprocessor/computer sends a signal to an alarm and/or flashing light
- system also automatically sends signal to police/security company
- since the house is large, sensors will be in zones; therefore computer will indicate on a control panel the zone where intruder broke in

(b) Differences between monitoring and control:

Monitoring:
- computer system takes information from the sensors compares the data with stored values
- warns/informs the user of status either by read outs or alarms

Control:
- computer system takes information from the sensors
- compares the data with stored values
- sends signals to devices to open/close, on/off etc.
- output from system can affect next input

4(a) Problems associated with robotics:

- out of paint (sensors in paint reservoir to indicate low paint levels)
- something in path of robot (sensors used to detect presence of an object)
- is item in correct position (sensors to ensure item present and in position)
- is item present (as above)

(b) Advantages of using robots rather than humans:

- they can work in conditions hazardous to humans
- robots don't need breaks (capable of working non-stop)
- they are less expensive in the long run since don't need any wages
- more productive (do same task faster than a human being)
- work is of a more consistent standard
- removes need for a human to do boring, repetitive tasks

5(a) How satellite navigation systems can be used to calculate a vehicle's positio

- satellites in outer space transmit signals to the Earth
- computers in the bus receive and interpret these signals
- the satellite relies on very accurate timing (atomic clocks)
- each satellite transmits data indicating position and time
- computer in bus calculates its position based on received satellite data
- at least three satellites are used to give the bus its exact position

(b) How the bus driver uses the satellite navigation system:

- the computer has a number of pre-stored maps
- bus location shown on appropriate map
- directions are given verbally or on-screen output (on a map)

(c) Advantages to the bus driver of using this system:

- it is generally safer (driver doesn't need to consult maps whilst driving)
- error reduction (e.g. can't go the wrong way down a one-way street)
- if the bus breaks down/involved in accident, its exact position is known to facilitate recovery (especially in remote areas)
- system can warn driver of speed cameras, road works, etc.

6(a) Setting up an Expert System:

- gather information from experts
- create/design a knowledge base
- gathered information from experts is added to the knowledge base
- rules (base) is created/designed
- inference engine is created/designed
- user interface is designed/created
- fully tested using known chemical compounds

(b) The function of the Explanation System:

- if a user can't answer one of the Expert system questions, the Explanation System will come up with a response to try and explain its "thought process"

7(a) Security issues and how to guard against them:

(NOTE; this question asks for a *description* of the security issues; for more in depth definitions refer to booklet 1 and good text book)

- hacking (use of passwords, ids, etc.)
- viruses (use of ant-virus software, firewalls, only use CD/DVDs from known sources)
- cookies/spyware (use appropriate clean up software, "clean" system up)
- WiFi open circuits (secure connection with passwords, etc.)

(b) Differences between intanet and internet:

- internet is INTERnational NETwork
- intranet is INTernal Restricted Access NETwork
- intranet only gives local information relevant to the company
- can block access to certain sites using intranet
- intranet data stored on servers with restricted access
- internet can be accessed by anyone from anywhere
- intranet requires passwords etc.

8(a) Collecting data for the model:

- counts number of people at checkouts ….
- …. at each time of day and each day of the week
- count how many people build up at the checkouts
- …. is it a weekday, weekend or bank holiday
- how long does it take to serve a customer
- other data (special offers)

(b) Carrying out the simulation:

- number of checkouts opened and see how flow of people affected
- build up number of customers at checkout, open extra checkouts and see how it affects time to be served, etc.
- increase/decrease number of customers and observe the affect
- once simulation is run, number of checkouts needed is determined ….
- … and interaction with customers is determined so that optimum throughput is achieved
- look at fault scenarios (breakdown of equipment etc.)

(c) Advantages of simulations (in general):

- cost savings (e.g. no need to crash test several cars)
- it is possible to try out various scenarios in advance
- quicker to get results (no need to build and test a real system)
- it is possible to test systems which would take years to obtain “real” data (e.g. environmental/weather predictions)

(d) Other areas where simulations can be used:

- training
- running/testing chemical and nuclear plants
- trying out equipment in hostile environments (e.g. under the sea, in outer space etc.)
- crash testing cars
- financial simulations (e.g. effect of inflation)
- population growth
- weather/climate predictions

9 Refer to the notes on pages 16 to 17 (booklet 1) to see how computer systems are used to create animation (special effects) in film and television. An essay should include: animation, tweening, morphing, rendering, avars, wire frames, and how these combine to make special effects/animation.

10(a) Video conferencing:

- delegates speak into central microphone
- webcam takes video images in real time
- delegates hear speech through loud speaker system
- system uses internet/WAN/broadband modem to transmit data
- requires use of compression software/CODEC
- need for echo cancellation software

(b) Reasons for the popularity of video conferencing:

- safety reasons (increase in terrorism, frequent travelling are all risks)
- communications links are now much faster (better images etc.)
- costs (money saved on travelling, accommodation, costs of lost time whilst employees are out of the office, etc.)
- improvements to workers (e.g. can work from home, less stress from driving/ travelling to work, doesn't disadvantage disabled, etc.)
- pollution aspects (e.g. less traffic (car and air))
- flexibility – ability to call a meeting at short notice

Booklet 2 – answers and hints

1(a) Methods for gathering information: Advantages of method:

- observation
  - reliable data
  - see exactly what is done
  - inexpensive method
- questionnaires
  - fast method of data gathering
  - inexpensive method
  - individuals can be anonymous
  - quicker to analyse data
- interviewing
  - easier to motivate interviewee
  - gives the opportunity to expand on answers given by interviewee
  - can ask specific questions
- look at existing paperwork
  - look at how files are kept
  - what is kept in files
  - look at training manuals
  - check company accounts
  - can decide on file size, memory requirements, devices needed, etc.

(NOTE: could also include focus groups here)

(b) What to do before making system live:

- produce user documentation and technical documentation
- install hardware and software
- fully test the new system
- train the staff to use the new system

(c) Reasons for choosing Pilot and Parallel:

- Pilot (could introduce system in one section of car dealership or, if a large chain, introduce the whole system in one of the car dealerships and see how it performs before rolling out to all the other dealerships in the chain)
- Parallel (could run the two systems together to make sure it works alright)

2 Types of test data:

- normal (e.g. 15 – you would expect this data to be accepted since 15^0C is a reasonable temperature)
- abnormal (e.g. -500, 200 – you would expect an error message since -200^0C or -500^0C are not reasonable temperatures)
- extreme (e.g. -40, 50 – you would expect these extreme values (boundaries of acceptability) i.e. -40^0C and 50^0C to be accepted as boundary values.

3 Design stage tasks:

- design data capture forms
- design screen layouts
- design output forms/layouts
- produce systems flowcharts and/or pseudocode
- select/design validation rules
- select most appropriate data verification method(s)
- design file structures/tables
- select/design hardware (requirements)
- select/design software (requirements)
- produce algorithms/program flowcharts
- design testing strategy/plan

4 Advantages and disadvantages of changeover techniques:

Direct	Parallel	Pilot	Phased
- disastrous if new system fails - immediate benefits felt - reduced costs (only one system used) - less likelihood of failure since fully tested	- more expensive than direct since two systems in operation at the same time - more time consuming - still have old system if new system fails - can gradually train staff while both systems are running together	- if new system fails can easily go back to point where system failed - less expensive than parallel - can train staff while system being introduced in stages - can ensure system works before expanding	- if new system fails can easily go back to point where system failed - less expensive than parallel - can train staff while system being introduced in stages - can ensure system works before expanding

5 Assessing the effectiveness of the new system:

- compare final solution with original requirements
- identify any limitations in the system
- identify any necessary improvements that need to be made
- evaluate user responses to using the new system
- compare test results from new system with results from old system
- compare performance of new system with performance of old system
- effectiveness of the hardware
- effectiveness of the software

6 Tools to ensure project completed on time and to budget:

- use of Gantt charts to show all the tasks
- use of Gantt charts to show critical paths
- use of Gantt charts to show key project milestones
- use of Gantt charts to show:-
    - number of days to do the tasks
    - progress as percent completed
    - progress versus expected time to do work
    - how tasks are linked together
    - allows the emailing of tasks/project information to others automatically
- use of Gantt charts allow use of the intranet/email facility to post or download project information to others
- Gantt charts allow use of PERT charts (each task in the project is represented and shows sequence and dependencies)

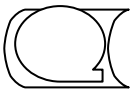
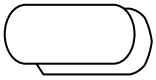
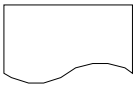
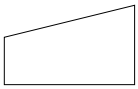
7 Information needed to decide on the hardware requirements:

- how much printing will be done
- memory size requirements (e.g. for files)
- size and resolution of monitors (e.g. will large drawings be shown on screen?)
- input and output requirements (e.g. scanners, mouse, etc.)
- portability requirements
- will disabled people be using the hardware?
- does it need to be compatible with existing systems?

8 Items needed in User Documentation and Technical Documentation

User Documentation	Technical Documentation
- how to load/run software - how to save files - how to do a search - how to sort data - how to do printouts - how to add/delete/amend records - purpose of system/program/package - (input) screen layouts - (output) print layouts - hardware requirements - software requirements - sample runs (with results) - error handling/meaning of errors - how to log on/log out	- program listing/coding - program language(s) used - flowcharts/algorithms - purpose of system/program/package - input formats - minimum memory requirements - known “bugs” in the system - list of variables used - file structures - hardware requirements - software requirements - sample runs (with results) - output formats - validation rules - verification techniques

9 Systems flowchart symbols

 Online storage (files stored on hard discs, etc)	 Connector (a link to or from another part of diagram)	Magnetic Tape
 Visual Display Unit (Monitor)	Terminator (Start and end of the flow diagram)	 Data processing operation
 Document output (printed hard copy)	 Manual input (e.g. keyboard)	 Merge (e.g. join two files together)
 Sort (alphabetical, chronological, numeric)	 Collate	 Communication line (e.g. telephone line)
 Hard disk (file)	 Connector, off-page. (link from this diagram to another diagram)	 Input/Output operation

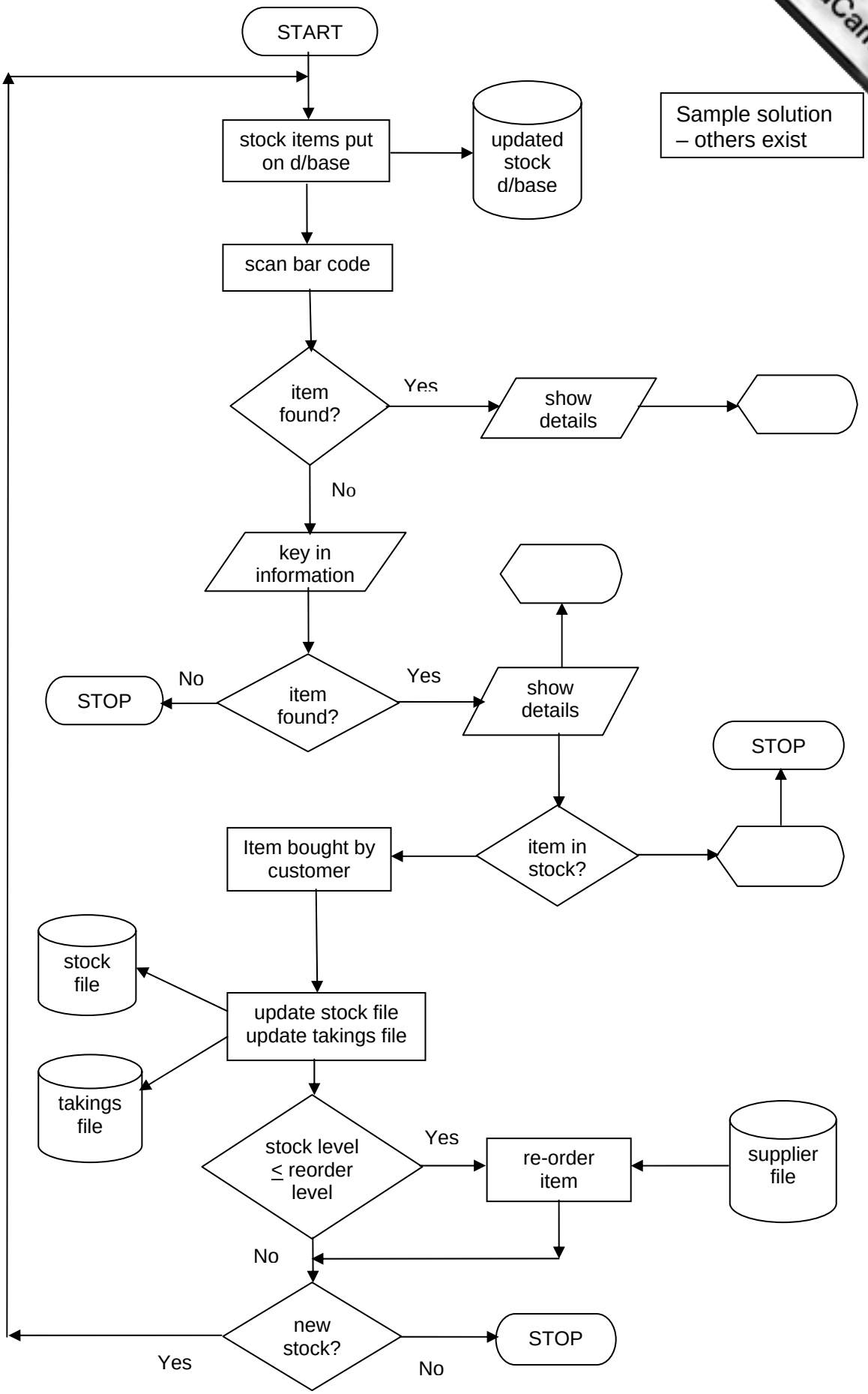
10(a) - *see page 10 for system flowchart for the new system*

10(b) Advantages of the new system:

- easier/faster to search for items
- improved stock control
- automatic stock control is possible
- less space taken up in filing system
- less expensive (fewer staff, etc.)
- no need to price individual items
- able to offer items on the internet

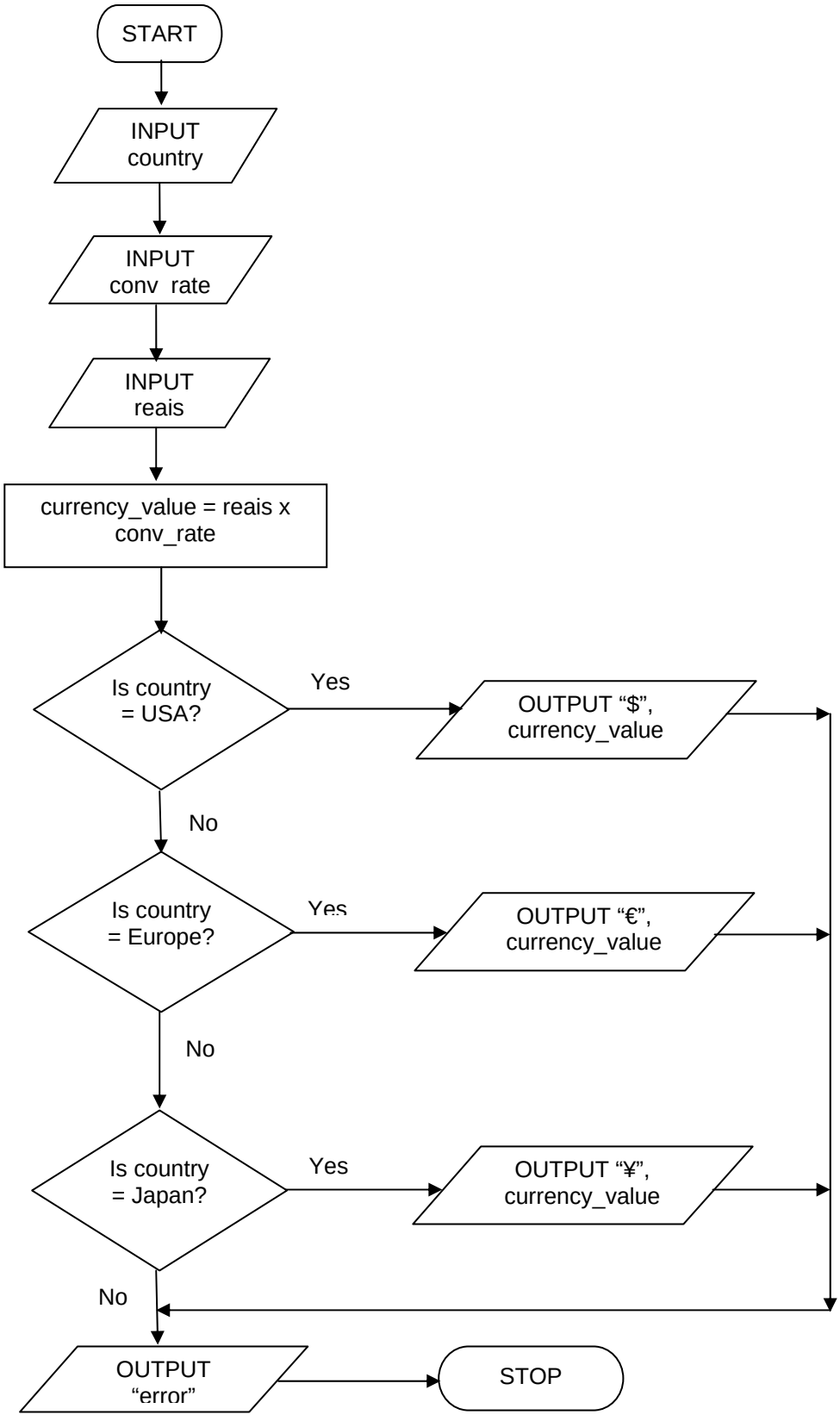
(c) Reduced costs:

- *refer to above advantages*

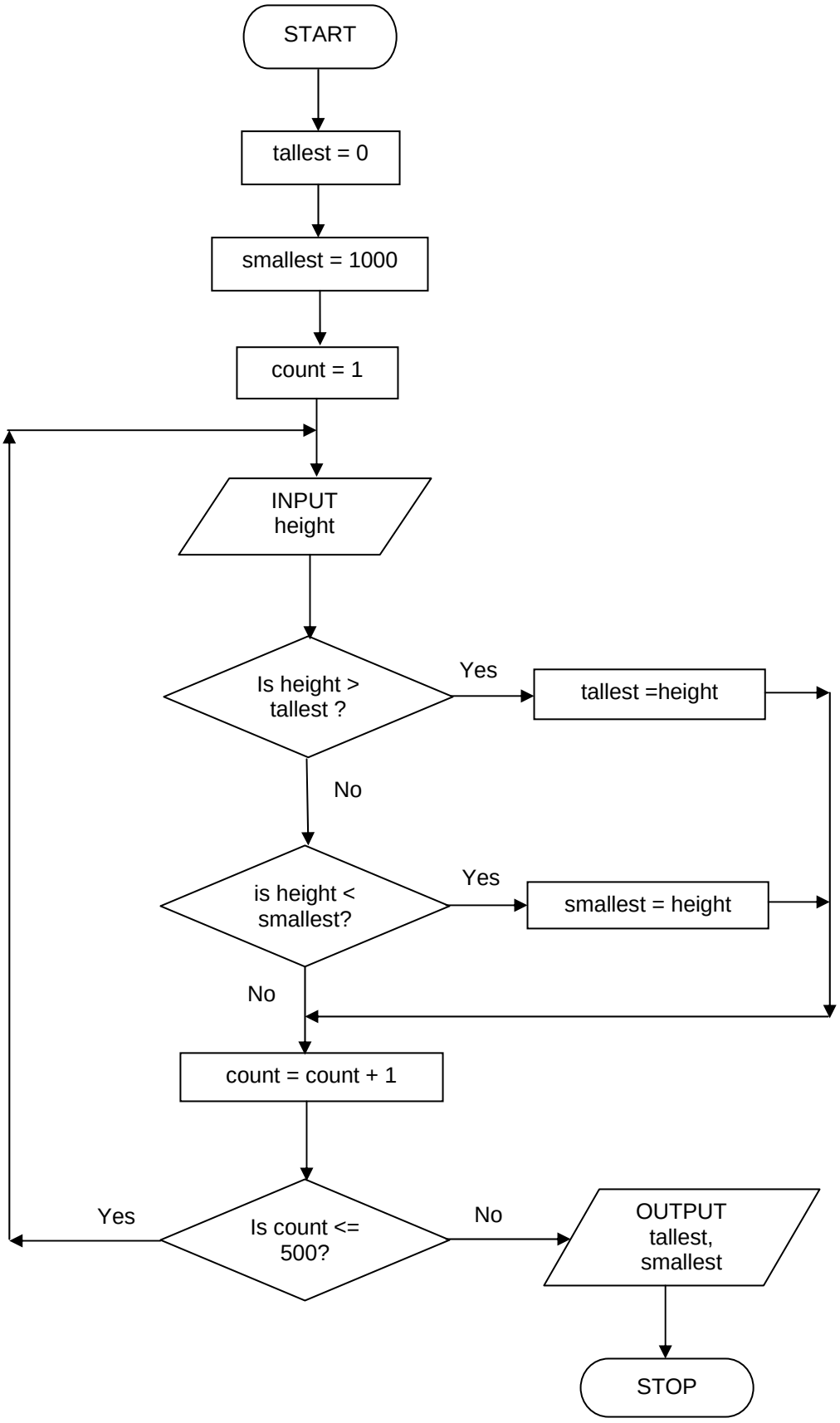


Booklet 3.1 – answers and hints

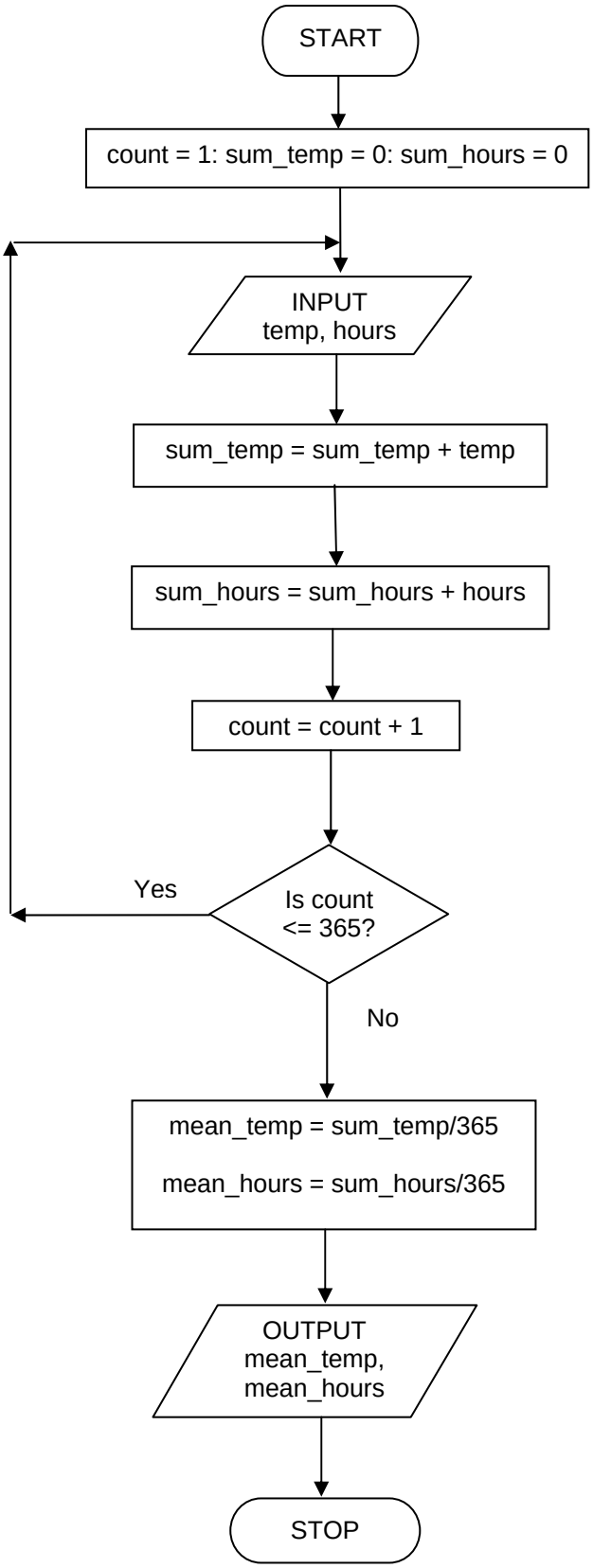
(1)



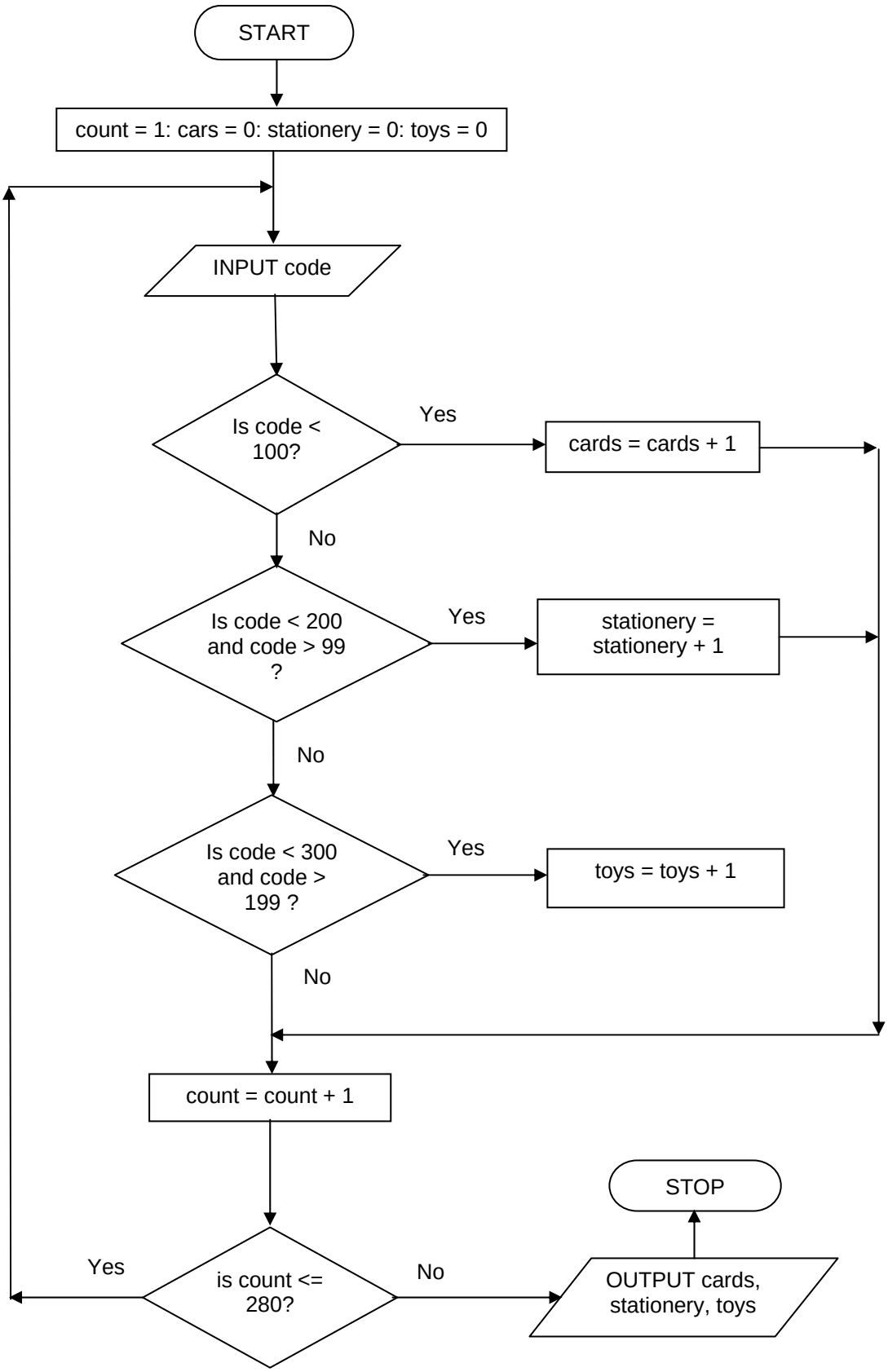
(2)



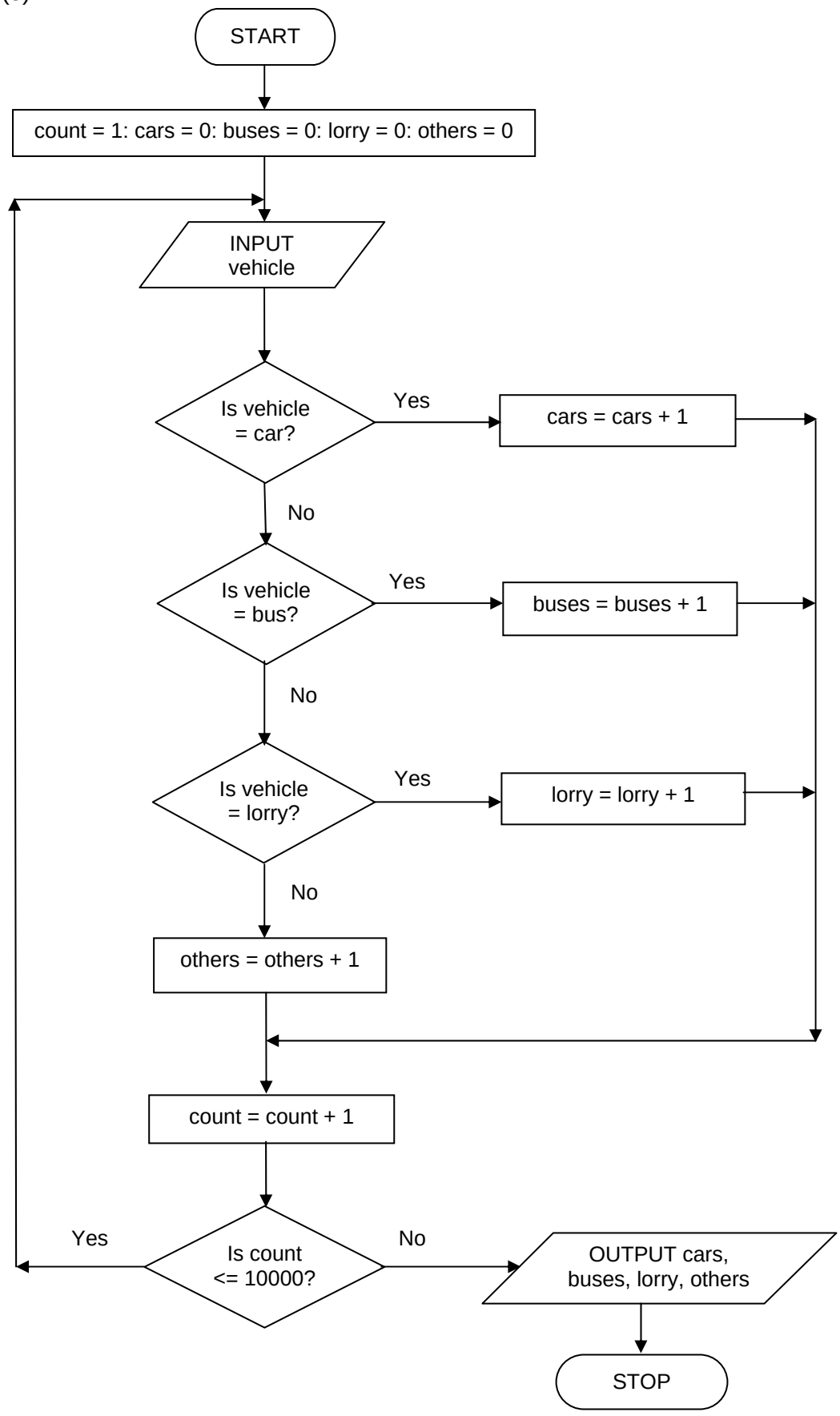
(3)



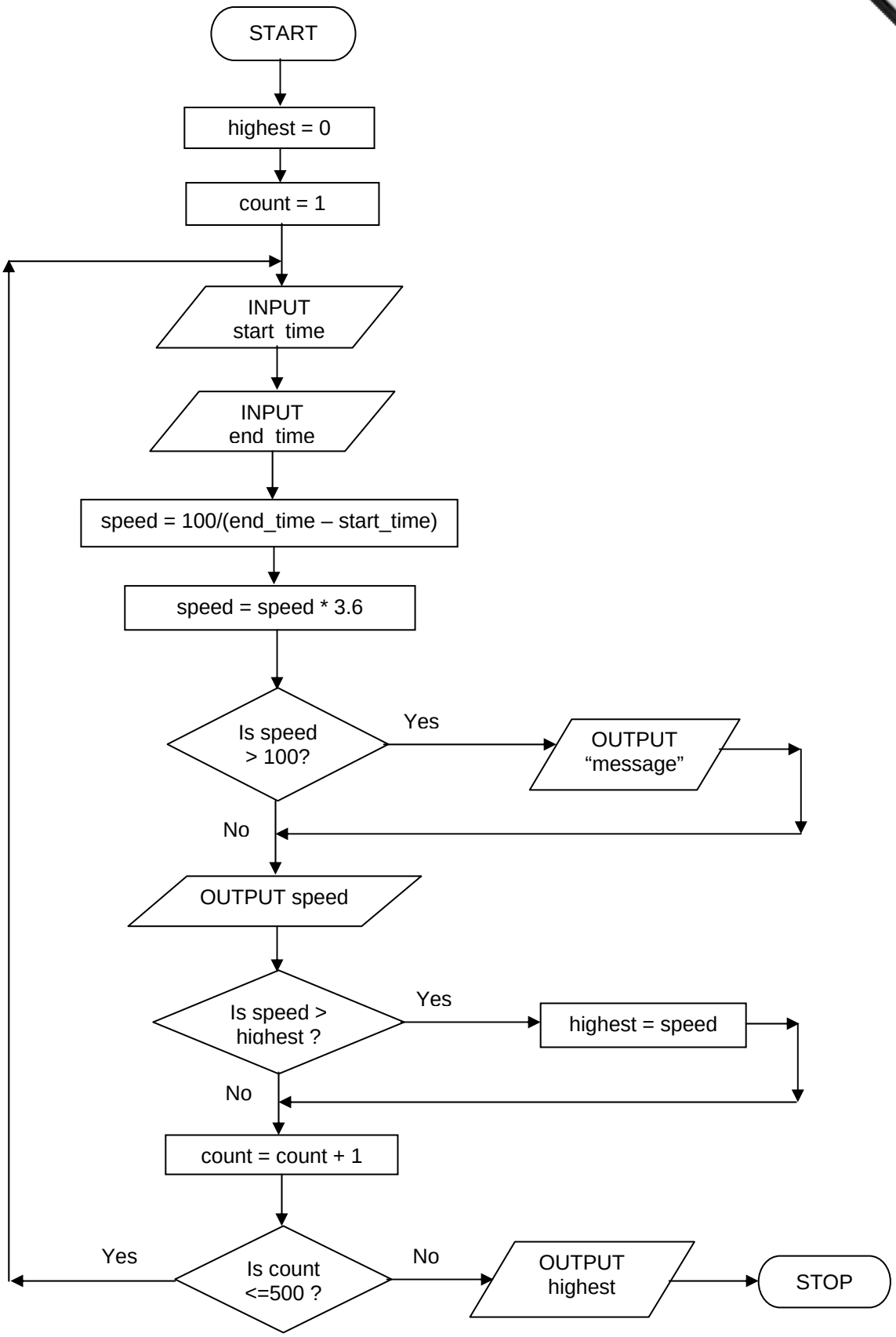
(4)



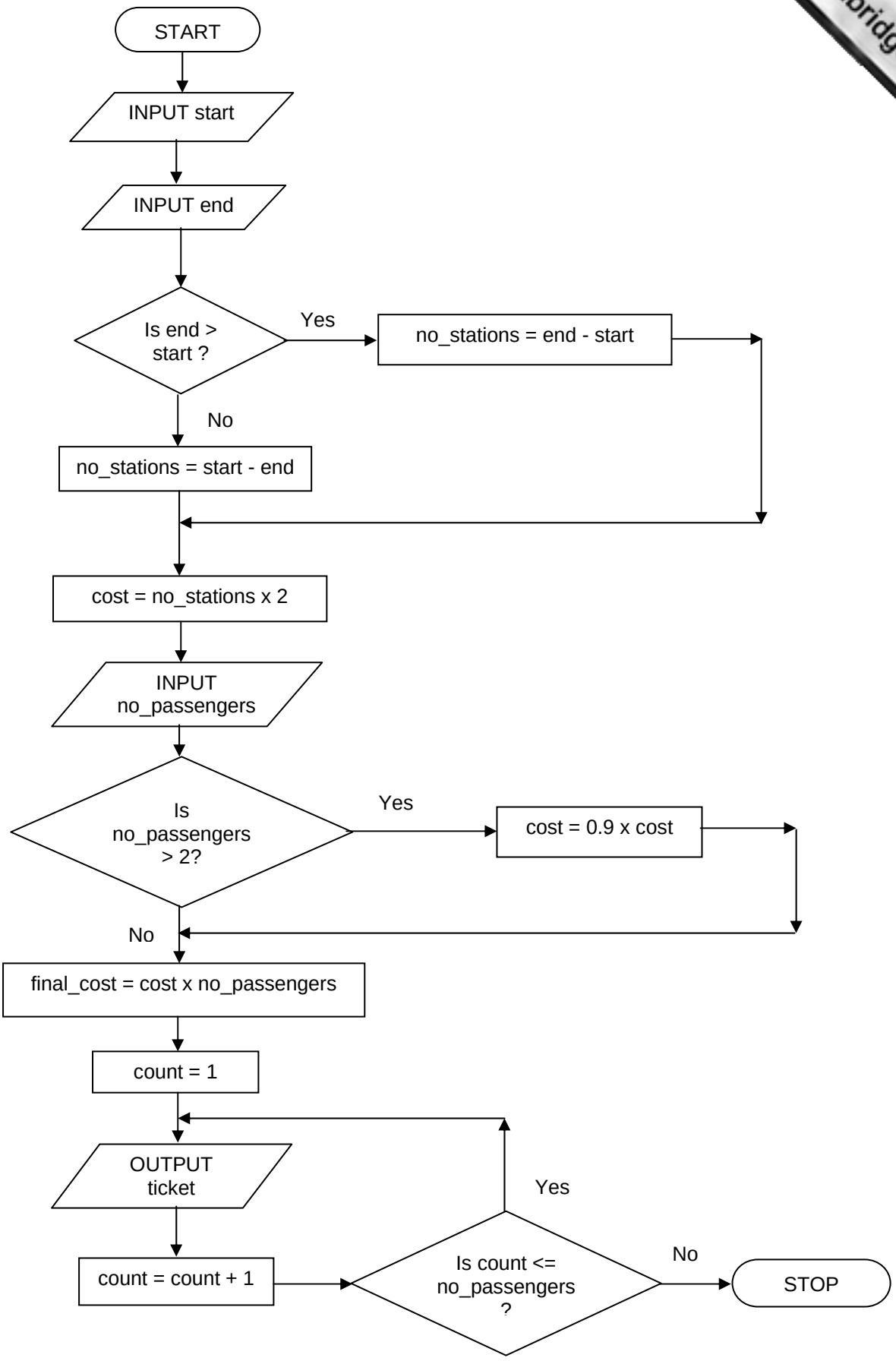
(5)



(6)



(7)



(8) (NOTE: there is an error in the question in booklet 3.1 – output box should OUTPUT X,T)

number	X	T	OUTPUT
45 35 25 15 5	0 1 2 3 4	45	4, 45
-2 -12	0 1	-2	1, -2
20.5 10.5 0.5	0 1 2	20.5	2, 20.5

(9) (NOTE: there is an error in the question in booklet 3.1 – the "others = others + 1" statement should by-pass all the other counting procedures)

vehicle	car	bus	lorry	other	OUTPUT
car car lorry bus van van car bus car end	0 1 2 3 4	0 1 2	0 1	0 1 2	4, 2, 1, 2

(10)

count	X	n	neg	p	pos	avge1	avge2	OUTPUT
1 2 3 4 5 6 7 8 9 10 11	5 -3 0 -3 7 0 6 -11 -7 12	0 1 2 3 4	0 -3 -6 -17 -24	0 1 2 3 4	0 5 12 18 30	-6	7.5	-6, 7.5

Booklet 3.2 – answers and hints

(1) Three errors:

line	error	correction
1	totals should be zero	negative = 0: positive = 0
2	loops 1001 times	**for** x = 1 **to** 1000
6	no checks for zeros Input	**if** number = 0 **then** zero = zero + 1 (OR **else** zero = zero + 1)

(lines 6 to 9 need to be re-numbered 7 to 10; also need to add the following:
zero = 0 in line 1 and add zero to output list at the end of the algorithm)

(2) Three errors:

line	error	correction
1	wrongly set value	highest = 0
3	while loops never stops	**while** days <= 5000 **do**
9	average needs to be outside while loop	line 9: **endwhile** line 10: average = total/500

(3) Three errors:

line	error	correction
3	sum = 0 inside loop	should be set outside loop before line 1
3	sum = 0 initial value	this value should be sum = 1
5	calculation	result = n/sum should come between lines 6 and 7

(4)
1 **input** country
2 **input** conv_rate
3 **input** no_reais
4 currency_value = no_reais * conv_rate
5 **if** country = USA **then print** "$", currency_value
6 **if** country = Europe **then print** "€", currency_value
7 **if** country = Japan **then print** "¥", currency_value

(5)
```
1  tallest = 0
2  shortest = 500
3  for count = 1 to 500 do
4          input height
5          if height > tallest then tallest = height
6          if height < smallest then smallest = height
7  next
8  print tallest, shortest
```

(6)
```
1  sum_temp = 0: sum_hours = 0
2  for count = 1 to 365 do
3          input temp, hours
4          sum_temp = sum_temp + temp
5          sum_hours = sum_hours + hours
6  next
7  mean_temp = sum_temp/365
8  mean_hours = sum_hours/365
9  print mean_temp, mean_hours
```

(7)
```
1  cards = 0: stationery = 0: toys = 0
2  for count = 1 to 280 do
3          input code
4          if code < 100 then cards = cards + 1
5          if code > 99 and code < 200 then stationery = stationery + 1
6          if code > 199 and code < 300 then toys = toys + 1
7                  else print “error”
8  next
9  print cards, stationery, toys
```

(8)
```
1  cars = 0: buses = 0: lorry = 0: others = 0
2  for count = 1 to 10000 do
3          input vehicle
4                  if vehicle = car then cars = cars + 1
5                  if vehicle = bus then buses = buses + 1
6                  if vehicle = lorry then lorry = lorry + 1
7                      else others = others + 1
8  next
9  print cars, buses, lorry, others
```

(9)
```
1  highest = 0
2  for count = 1 to 500 do
3        input start_time, end_time
4        speed = 100/(end_time – start_time)          {NOTE: m/second}
5        speed = speed * 3.6                  {NOTE: conversion to km/hour}
6        if speed <= 100 then print “speed is OK”
7             else print “maximum speed exceeded”
8        print speed
9        if speed > highest then highest = speed
10 next
11 print highest
```

(10)
```
1  input start
2  input end
3  if end > start then no_stations = end – start
4        else no_stations = start – end
5        cost = no_stations * 2
6        input no_passengers
7        if no_passengers > 2 then cost = 0.9 * cost
8        final_cost = cost * no_passengers
9  print final_cost
10 print tickets
```

[NOTE: it is possible to use other loop structures other than **for …. to**; the algorithms would work equally as well with **repeat …. until** or **while …. endwhile.** The **for …. to** loops work particularly well when an exact count is known (e.g. exactly 100 temperatures). If we had to input temperatures until they became negative it would be best to use a **while** or **repeat** loop, for example].

Booklet 3.3 – answers and hints

(1)

A	B	X
1	1	1
1	0	0
0	1	0
0	0	1

(2)

A	B	X
1	1	1
1	0	1
0	1	0
0	0	0

(3)

A	B	X
1	1	0
1	0	1
0	1	0
0	0	0

(4)

A	B	C	X
1	1	1	1
1	1	0	0
1	0	1	1
1	0	0	0
0	1	1	1
0	1	0	0
0	0	1	0
0	0	0	0

(5)

A	B	C	X
1	1	1	1
1	1	0	0
1	0	1	0
1	0	0	0
0	1	1	0
0	1	0	0
0	0	1	0
0	0	0	0

(6)

A	B	C	X
1	1	1	1
1	1	0	0
1	0	1	1
1	0	0	0
0	1	1	1
0	1	0	1
0	0	1	1
0	0	0	1

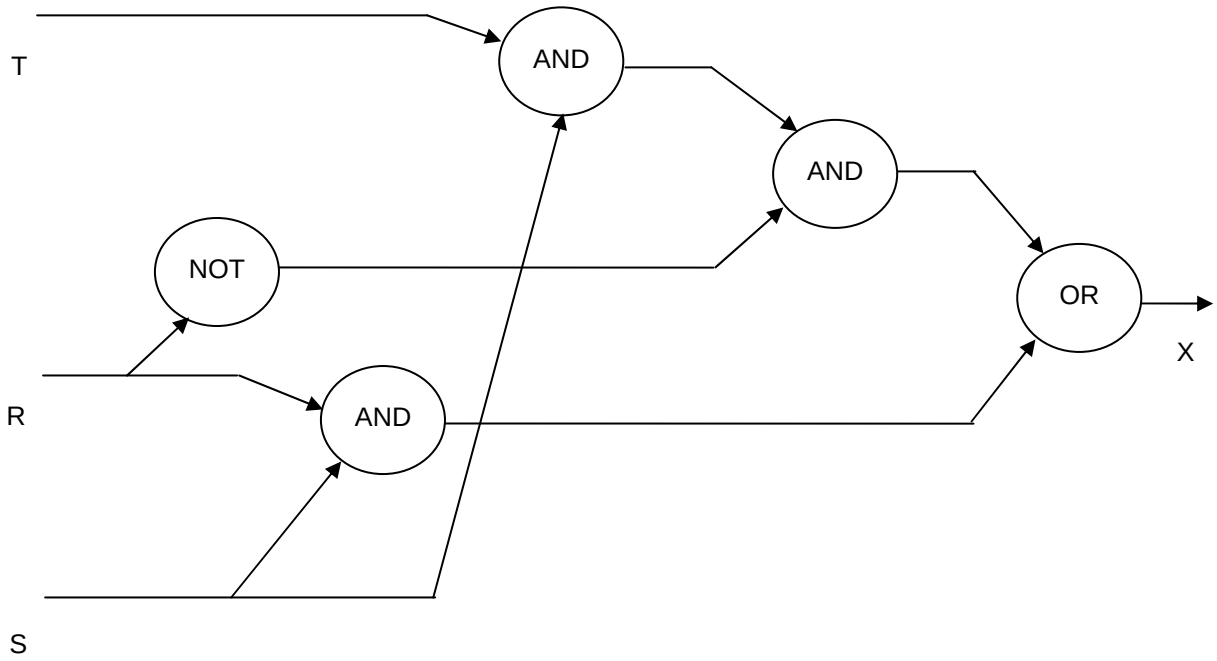
(7) Statement:

X = 1 if (R = 1 **AND** S = 1) **OR** (R = **NOT 1 AND** (S = 1 **AND** T = 1))

Truth table:

R	S	T	X
1	1	1	1
1	1	0	1
1	0	1	0
1	0	0	0
0	1	1	1
0	1	0	0
0	0	1	0
0	0	0	0

Logic network:



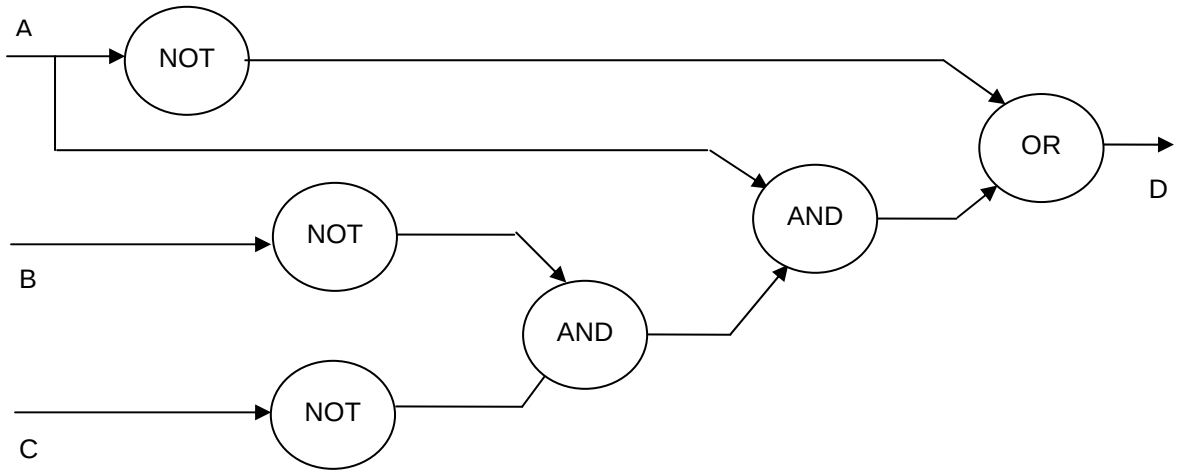
(8) Statement:

D = 1 if (A = **NOT** 1) **OR** (A = 1 **AND** (B = **NOT** 1 **AND** C = **NOT** 1))

Truth table:

A	B	C	D
1	1	1	0
1	1	0	0
1	0	1	0
1	0	0	1
0	1	1	1
0	1	0	1
0	0	1	1
0	0	0	1

Logic network:



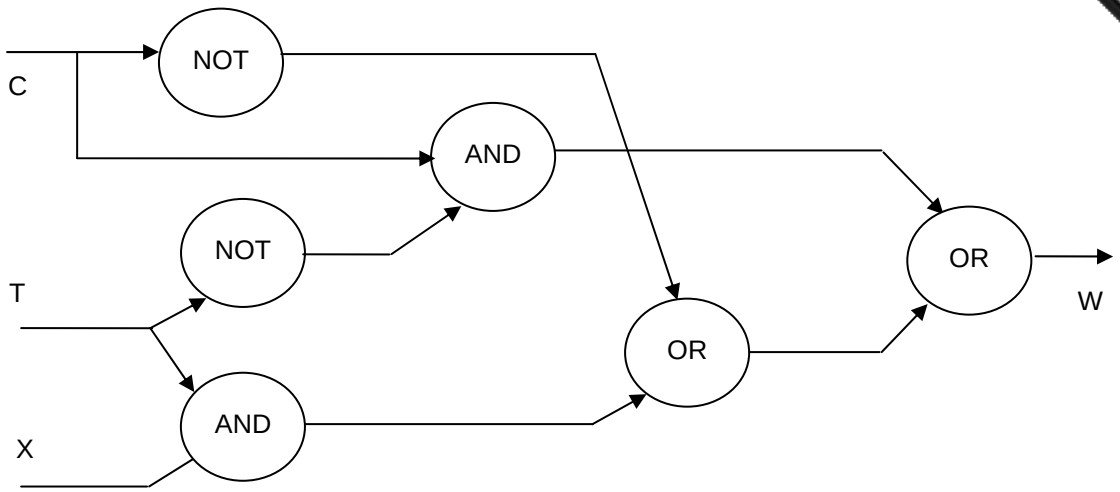
(9) Statement:

W = 1 if (C = **NOT** 1) **OR** (T = 1 **AND** X = 1) **OR** (C = 1 **AND** T = **NOT** 1)

Truth table:

C	T	X	W
1	1	1	1
1	1	0	0
1	0	1	1
1	0	0	1
0	1	1	1
0	1	0	1
0	0	1	1
0	0	0	1

Logic network:



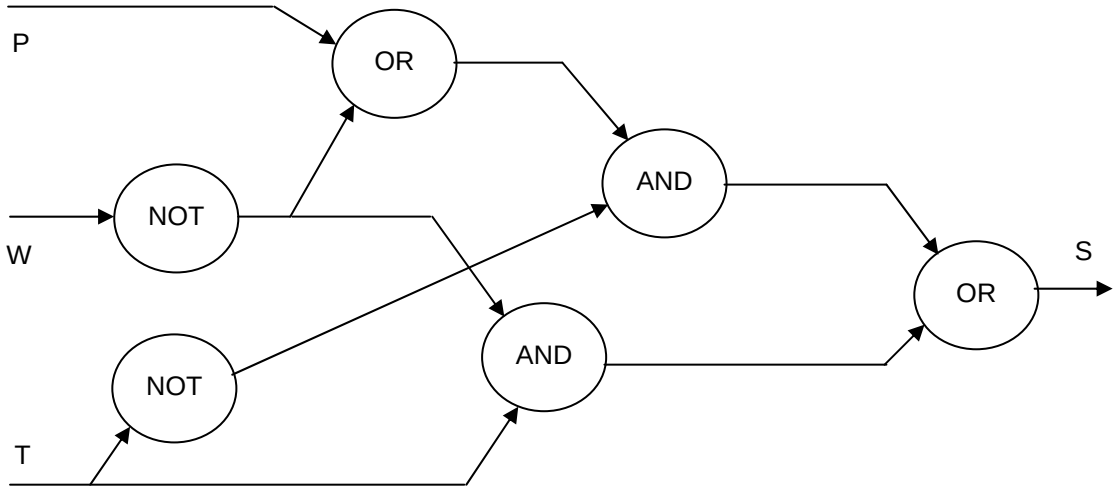
(10) Statement:

S = 1 if (T = 1 **AND** W = **NOT** 1) **OR** (T = **NOT** 1 **AND** (P = 1 **OR** W = **NOT** 1))

Truth table:

T	P	W	S
1	1	1	0
1	1	0	1
1	0	1	0
1	0	0	1
0	1	1	0
0	1	0	1
0	0	1	0
0	0	0	0

Logic network:



Booklet 4 – answers and hints

(1) Methods used in automatic data capture + applications

- data logging	e.g. monitoring river pollution
- bar code readers	e.g. stock control, getting prices at POS
- RFID	e.g. tracking livestock on a farm
- biometrics	e.g. fingerprints at airport security
- magnetic stripe reader	e.g. cards used to open doors in secure areas
- OCR	e.g. scanning paper documents into computer
- voice recognition	e.g. help disabled people enter data into computer
- smart cards	e.g. loyalty cards storing "points"
- OMR	e.g. reading questionnaires directly

(2) Possible validation checks:

Title and sex	- consistency check
Date of birth	- format check
Pay number	- character/type check, check digit, length check
Telephone No	- character/type check, length check
Pay	- range check

(3)(a) 10 9 8 7 6 5 4 3 2 1 ← position

0 5 5 5 2 1 6 2 2 5 ← bar code digits

Multiplication: (10x0)+(9x5)+(8x5)+(7x5)+(6x2)+(5x1)+(4x6)+(3x2)+(2x2)+(1x5)

Result: 176/11 = 16 remainder 0. Hence, bar code check digit is **correct**

10 9 8 7 6 5 4 3 2 1 ← position

0 1 2 1 9 0 0 2 1 X ← bar code digits

Multiplication: (10x0)+(9x1)+(8x2)+(7x1)+(6x9)+(5x0)+(4x0)+(3x2)+(2x1)+(1x10)

Results: 104/11 = 9 remainder 5. Hence, bar code check digit is **incorrect**

(b) 10 9 8 7 6 5 4 3 2 1 ← position

0 1 5 0 2 4 6 2 2 ? ← bar code digits

Multiplication: (10x0)+(9x1)+(8x5)+(7x0)+(6x2)+(5x4)+(4x6)+(3x2)+(2x2)

Results: 115/11 = 10 remainder 5. Hence check digit is 11 – 5 i.e. **6**

(alternative: to make the total, i.e. 115 into a number which gives a remainder of 0 when divided by 11 (i.e. 121) we need to add 6 – which also gives us the check digit).

(c) Check digits can identify the following errors:

- inverted figures i.e. 23**459** instead of 23**549**

- incorrect digits i.e. 23**559** instead of 23**549**

- missed digits i.e. 23**59** instead of 23**549**

4(a) Verification methods:

- double data entry (two people type in the same data from source document)
- visual check (where the information on screen is compared to source document)
- parity check (where the number of bits is checked for even or odd)

(b) Examples where verification checks are made:

- password entry check
- when filling out forms on line (e.g. verify your age)

(many more examples exist)

5(a) B = 1 and D = 1

i.e. floor sensor and infra red sensor detect presence of an intruder

(since 0 1 1 0 is equal to 6), the intruder has been identified in zone 6

C = 1

i.e. door sensor detects presence of an intruder

(since 1 0 1 1 is equal to 11), the intruder has been identified in zone 11

(b) 1 0 0 1 1 1 1 1

6 Features expected in word processors to allow one page fitting:

- set page size
- change font size
- change margins
- page format
- don't use bold type
- re-size photographs
- remove (edit) unwanted text

7 Four software packages:

- advertise the college (use DTP – could also use word processor or authoring software)
- keep track of students and staff information (use a database)
- keep track of payment of fees (use of spreadsheets)
- produce on line courses (use authoring software – could also use DTP or word processing)

8 Differences between word processing and DTP:

- DTP allows elements on a page to be moved about as required; word processor usually requires a linear approach (i.e. paragraph by paragraph, page by page)
- repeating elements (e.g. company logo) can be placed on master pages; with word processors each page has to be set up separately
- use of frames in DTP (i.e. create layout, link frames as required and add text in frames later)

9(a) G4 cell: = ((B4 – F4)/B4) * 100

(b) G10 cell = SUM(G2:G9)/8 or

= AVERAGE(G2:G9) or

= (G2+G3+G4+G5+G6+G7+G8+G9)/8

(c) G11 cell = MAX(G2:G9)

(d) - draw a graph of the given data and use a tend line to predict; extend graph to ten graph
(or use mathematical formula (best fit) based on existing curve to allow predictions to be made)
- add additional columns assuming that depreciation follows a “known pattern”

(10)(a) 8 (A to H)

(b) E

(c) (Lowest temp (^{0}C) < -25) AND (Capacity (m^3) > 0.25)

Booklet 5 – answers and hints

1(a) Examples of household appliances using microprocessors:

(b) Together with what is controlled:

Appliance	What is controlled
Digital camera	shutter speed, lens focus, flash, aperture, etc.
Washing machine	Water temperature, cycle time, wash cycle, loading, etc.
Television	Tuning of stations, decoding of digital signals, interface with devices, picture/sound control
Microwave oven	Timing, weight calculations, function (e.g. defrost etc.)

2(a) Types of sensor and applications where they are used

Sensor	Application(s)
Temperature	Central heating system, chemical process
Moisture	Greenhouse environment, production where moisture is an issue (e.g. pharmaceuticals)
Oxygen	Pollution monitoring, engine management systems
Light	Greenhouse environment, traffic light control, automatic doors
pH	Pollution monitoring, greenhouse (soil), chemical process control
Infra red	Burglar alarms, counting people, detection of heat sources (e.g. automatic light control in washrooms)
Pressure	Burglar alarm, counting vehicles (traffic light control)
Acoustic	Burglar alarm (listening for foot steps, measuring flow rates of liquids in pipes (chemical plant)
Motion	Radar guns (traffic speeding detectors)
Proximity/distance	*Same applications as* ***light sensors and infra red sensors***

(b) Example chosen: automatic doors:

- (light, infra red, pressure) sensors monitor the area constantly
- if a person is detected (breaks a beam or heat source picked up or weight detected on a pressure mat) ….
- …. a signal is sent to the microprocessor controlling the process
- …. an ADC is used if the signal is analogue
- the microprocessor compares incoming signal with stored data/current status (e.g. checks if the door is already open)
- if a person has been identified, then a signal is sent ….
- …. to an actuator to open the door

3(a) Differences between RAM and ROM

RAM
- volatile memory
- can be written to or contents read
- temporary store to hold data currently being used

ROM
- holds instructions to start computer (e.g. BIOS)
- can only be read and cannot be changed (i.e. ROM cannot be written to or edited)
- non-volatile memory

(b) Uses for various memory devices:

Application	Device	Reason for choice
Multimedia files	MP4 or DVD	Holds large amounts of data to allow audio, visual, video and animation
Music files	MP3	Compresses sound files to allow several tracks to be stored using less memory
Word processed document	CD or flash memory	Can store files which can be taken away and used on any computer; don't normally need a huge memory capacity therefore other devices not really needed

4 Devices to help disabled people:

Device	Application
Touch screens + head wand	For people who can't use a keyboard allowing input; also helps people with learning difficulties since icons are easier to understand
On-screen keyboards	For people who can't use keyboards (use head wand to select letters)
Voice recognition	Blind and partially-sighted people can communicate with a computer using microphone and software (keyboard and touch screens can't be used)
Trackerball	Easier to use than a mouse if people have problems using their arms and hands or if they have a coordination problem
Large font size/use of colour	Helps people who are partially-sighted since the larger icons and/or colourful outputs on large screens are much easier to see
Braille printers	Dot matrix printers can be modified to produce raised dots (i.e. Braille) – this helps blind and partially-sighted people to read the output
Voice synthesis	Loud speakers and special software are used to output information in the form of sound to help blind and partially-sighted people; it also helps people who have difficulty reading/understanding text
Large/concept keyboards	These help people who have difficulty using normal keyboards (either because of difficulty using hands/ arms or coordination problems)
Foot activated controls	To allow people with restricted hand/arm movement to communicate

5 Data stored on magnetic stripes and bar codes:

- bar codes would contain key data such as product details (data is coded in the form of light and dark bands of variable thickness)
- magnetic stripes (these contain key data such as customer account number, etc. and is stored in an electronic form)

validation check on a bar code and credit card is usually a check digit

6(a) Input devices on an information kiosk:

- touch screen
- mouse/trackerball
- light pens

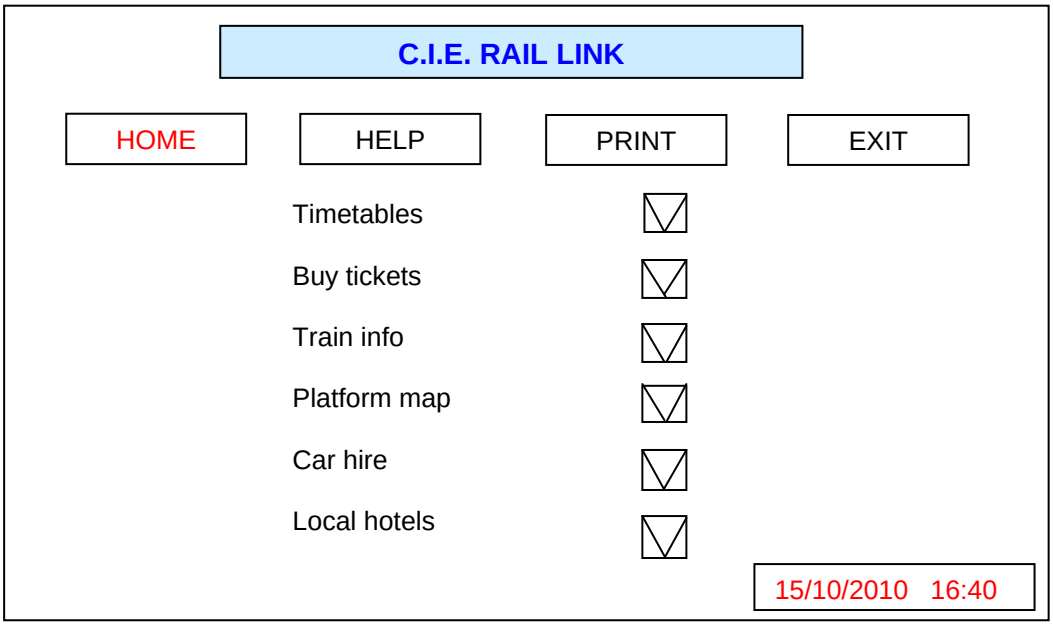
(b) Advantages of automatic kiosks to customers:

- no language problems
- no need to wait in a queue
- always open
- information usually more up to date and more accessible

(c) Advantages to management:

- system can be linked into websites to give live updates
- can advertise special offers, services, notices, etc.
- lower costs to the company (fewer staff to pay)

(d) Sample screen:



[NOTE: there is no "right answer" to this type of question. Examiners will look out for (1) layout is sensible (not crammed into one corner) (2) logical screen options given (3) clearly a computer screen (e.g. drop down menu boxes)]

7(a) Operating system provides, for example:

- user interface
- device management
- handles interrupts
- spooling
- memory management
- multitasking
- batch processing
- multiprogramming
- error reporting/handling
- loading/running software
- processor management
- maintain user accounts
- utilities (e.g. copy, save, re-name, sort, etc.)

(b) RTTP features:

- fast response needed
- files updated immediately
- used when making bookings (etc.) to stop double booking
- no control takes place, but human involvement takes place

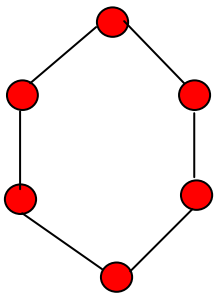
RTPC features:

- use of sensors and feedback loops
- output can influence the input
- used to monitor and control processes
- usually no human involvement needed

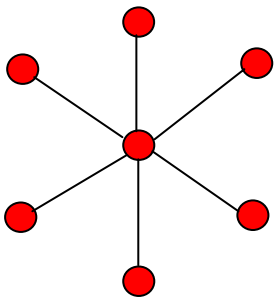
(c) Applications include:

(i) booking airline tickets
(ii) control of a chemical process

8(a)



RING



STAR

(b) Advantages of ring:

- works well under heavy loading
- possible to create large networks

Advantages of star:

- if one station fails/connection fails the other stations are not affected
- easier to identify faults in the system
- easy to expand network

Disadvantages of ring:

- faulty connection between two stations can cause network failure
- difficult to add new stations

Disadvantages of star:

- if central hub breaks down, the whole network fails

9(a) Features expected in the presentation:

- multimedia (text, graphics, video, animation, sound, etc.)

(b) Laptop features:

- can store presentations on the hard drive
- portable system can link into any multimedia system
- take full advantage of WiFi system

(c) Advantages of scanning in books to customers:

- easy to import text, graphics, photos, etc. into own work
- easier to locate information in books
- easier to cross-check information in books
- access to old and rare books (more accessible)
- can “blow up” text/diagrams to make them clearer
- easier to “make notes” on the pages for future reference
- more than one customer can access a book at the same time

10(a) 90% reduction – so memory space required is ~ 4.5 Mbyte

(b) DVD features:

- dual layering
- higher density of data storage is possible

(c) Reasons for increase in usage of CDs/DVDs:

- greater capacity (can store multimedia files)
- more robust technology (harder to damage)
- longer “shelf life” if stored properly