Design & Technology
A-Level

Modern manufacturing systems

Materials required for questions

- Pencil
- Rubber
- Calculator

Instructions

- Use black ink or ball-point pen
- Try answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- Use a cross in the box to mark you answer ☒

Advice

- Marks for each question are in brackets
- Read each question fully
- Try to answer every question
- Don’t spend too much time on one question

Good luck!

Q1. What is a **NOT** a benefit of a robust IT system in production logistics?

A Monitor progress easily ☐

B Easily access information ☐

C Easy to use ☐

Q2. What is **NOT** a way AGV's are guided?

A Through remote control ☐

B Through laser guidance ☐

C Through radio wire guidance ☐

Q3. Why might a company buy in standardised parts? ☐

A Readily available

B More reliable ☐

C More quality control ☐

Q4. What is a **disadvantage** of using robots in production?

A Not as safe as human workers ☐

B Not as flexible as humans ☐

C Inexpensive set up costs ☐

Q5. Why might a manufacturer choose a robot over a human worker?

A Able to repeat repetitive tasks ☐

B Can perform multiple roles ☐

C Cheap to maintain ☐

Q6. What does CNC stand for?

A Computer Numerical Coordinates ☐

B Computer Numerical Control ☐

C Computer Numerical Coaxial ☐

Q7. What is not an area where AGVs can be used?

A Pallet trucks ☐

B Assembly line ☐

C Trailer unloading ☐

Q8. Why might a manufacture choose a human over ASRS?

A Humans can spot faulty parts ☐

B Humans are cheaper ☐

C Humans are safer ☐

Q9. Automated storage and retrieval systems (ASRS) are used in industry.

Explain two advantages of using an automated storage and retrieval system (ASRS) **(4 marks)**

1.

2.

Q10. Draw a flow chart to represent a closed loop system. **(2 marks)**

Q11. Explain two advantages of using an automated closed loop control system, compared to an open loop control system, in production. **(4 marks)**

Q12. Automatic guided vehicles (AGVs) are often used within modern manufacturing
systems.
Name two types of AGV. **(2 marks)**

1.

2.

Q13. Outline the key features of AGV guidance systems. **(4 marks)**

Q14. Modern manufacturing makes extensive use of computer integrated manufacture (CIM)

Outline the use of automated storage and retrieval systems (ASRS) within CIM **(4 marks)**

Answers

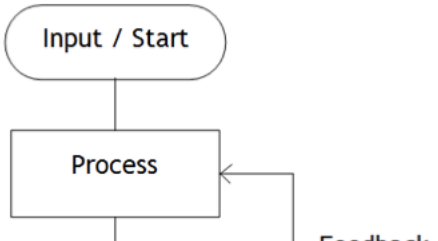
Q1. C
Q2. A
Q3. A
Q4. B
Q5. A
Q6. B
Q7. C
Q8. A

Q9.

- Items are located/ retrieved / delivered faster /more accurately/ right place right time (1)
- More efficient/faster business/company/production line/lean manufacturing time to market/ lead time (1)
- Items are easily catalogued / recorded/ on central database (1)
- Automatically reordered/never run out of stock/reduced human error (1)
- They can lift heavy loads (1)
- Safer/ reduced H&S issues (1)
- They can stack products in a more organised way/ higher (1)
- Reduced required floor space/land costs/better use of space
- They require very little manual input/run24/7/fully automated
- Reduced costs/ wages/ employment (1)

Q10.

- input (start), process, output (stop) (1) – all 3 required for 1 mark
- decision / feedback (1) – both required for 1 mark



Q11.

- Feedback/QC checks are made/used/carried out constantly (1)
- Improved/maintained control/accuracy of stock/material/product levels/quality/right first time/less faults (1)
- Improved tracking of performance (1)
- Able to predict maintenance / failure points (1)
- Early detection of faults (1)
- Reduced waste (1)
- Requires no human intervention (1)
- Reduced labour costs (1)
- Reduced human error/increased reliability (1)
- Increased/faster/quicker productivity/checking /cost saving/less time to market (1)
- Ability to adapt/make changes/decisions (1)
- More flexibility/customisation possible within the system (1)

Q12.

- Pallet trucks (1)
- Forklift / fork trucks (1)
- Towing vehicles / pull truck (1)
- Unit load vehicles (1)

- Light load (vehicles) (1)
- Assembly line vehicles (1)
- Heavy burden carrier vehicles (1)
- Automatic guided carts (1)

Q13.

- Control via a central / on-board computer (1)
- Programmed route or fixed route/path (1)
- Radio frequency wires / magnetic strip embedded in the factory floor (1)
- Painted line / floor mounted strip (1)
- Input sensors (1)
- Laser guidance (1)
- GPS guidance (1)
- Inertial (gyroscopic) navigation (1)
- Automated failsafe systems embedded in guidance systems /collision control (1) Barcode scanning (1)

Q14.

- Movement of materials/components to required position is controlled by computer (1)
- AGVs follow lines/buried wires/tape on/in the floor (1)
- AGVs can enter / work in dangerous areas where humans would be excluded (1)
- Materials / components are stored in a racking system (1)
- Automated use of bar code reader to identify components (1)
- Transportation via conveyor or automatic guided vehicle (AGV) (1)
- Automated transfer of component to/from transportation system via robotics/AGV forklift/crane (1)
- Faster/improves efficiency/runs 24/7 by reducing the labour required for distributing materials and components (1)