higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

COMPUTER-INTEGRATED MANUFACTURING
NQF LEVEL 4

XX February 2020

This marking guideline consists of 7 pages.

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QUESTION 1

1.1 1.1.1 The robot must have a robot arm.

1.1.2 The robot must have a computer-based controller that can be programmed through software.

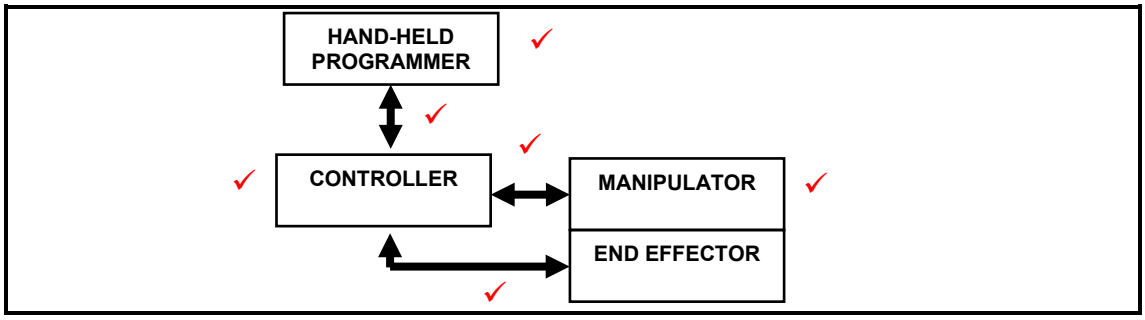
1.1.3 Robots must be versatile and capable of performing different tasks.

(3 × 2) (6)

1.2 Has the capability to:

- Make decisions via a control program
- Communicate with other machines
- Respond to sensory inputs (3)

1.3



(6)
[15]

QUESTION 2

2.1

- Operator duties such as starting and stopping the CNC machine tool and feeding materials as required
- Minor maintenance on the CNC machine tool and the required cutting tools so as to produce a part at the required quality
- Setting up the machine tool for part machining
- Creating an NC program to produce a part
- Troubleshooting and repairing a malfunction on a CNC machine tool

(Any 2 × 1) (2)

2.2

- Analyse the engineering drawing to extract the dimensional data and surface finish of the part to be machined and the set-up procedure of the machine tool to be used.
- Select the tool requirements and the required tool off-sets.
- Set up the zero position of the workpiece.
- Select the speed and rotation of the spindle.
- Set up the tool motion according to the profile required.
- Return the cutting tool to the reference point after completion of the work.
- End the program by stopping the spindle and coolant. (7)

2.3 2.3.1 Robotic programming
2.3.2 CNC machine tool programming
(2 × 1) (2)

2.4 2.4.1 (+X : +Y)
2.4.2 (+X : -Y)
2.4.3 (-X : -Y)
2.4.4 (-X : +Y)
(4 × 1) (4)

2.5 **%**✓
; PART✓
; 10810✓
N05 G90 OR G91✓
N10 G00 X0 Y0 Z+2 ✓
N15 G01 X10 Y10 Z+2 S800, F200, T01, M03✓✓✓✓✓
N20 G01 X10 Y10 Z-12 M09 ✓
N25 G01 X10 Y10 Z+2
N30 G01 X50 Y50 Z+2 ✓
N35 G01 X50 Y50 Z-12
N40 G01 X50 Y50 Z+2 ✓
N45 G01 X90 Y90 Z+2 ✓
N50 G01 X90 Y90 Z-12
N55 G01 X90 Y90 Z+2 M10 ✓
N60 G28 (15 × 1) (15)
[30]

QUESTION 3

3.1
- The operating software is specific to each robot manufacturer and is embedded in its own microprocessor.
- Application software is the software that can either be open software in that it can be used with any compliant robot system or it can be prioritised software specifically designed to be used with a specific robot system of a manufacturer. (2 × 2) (4)

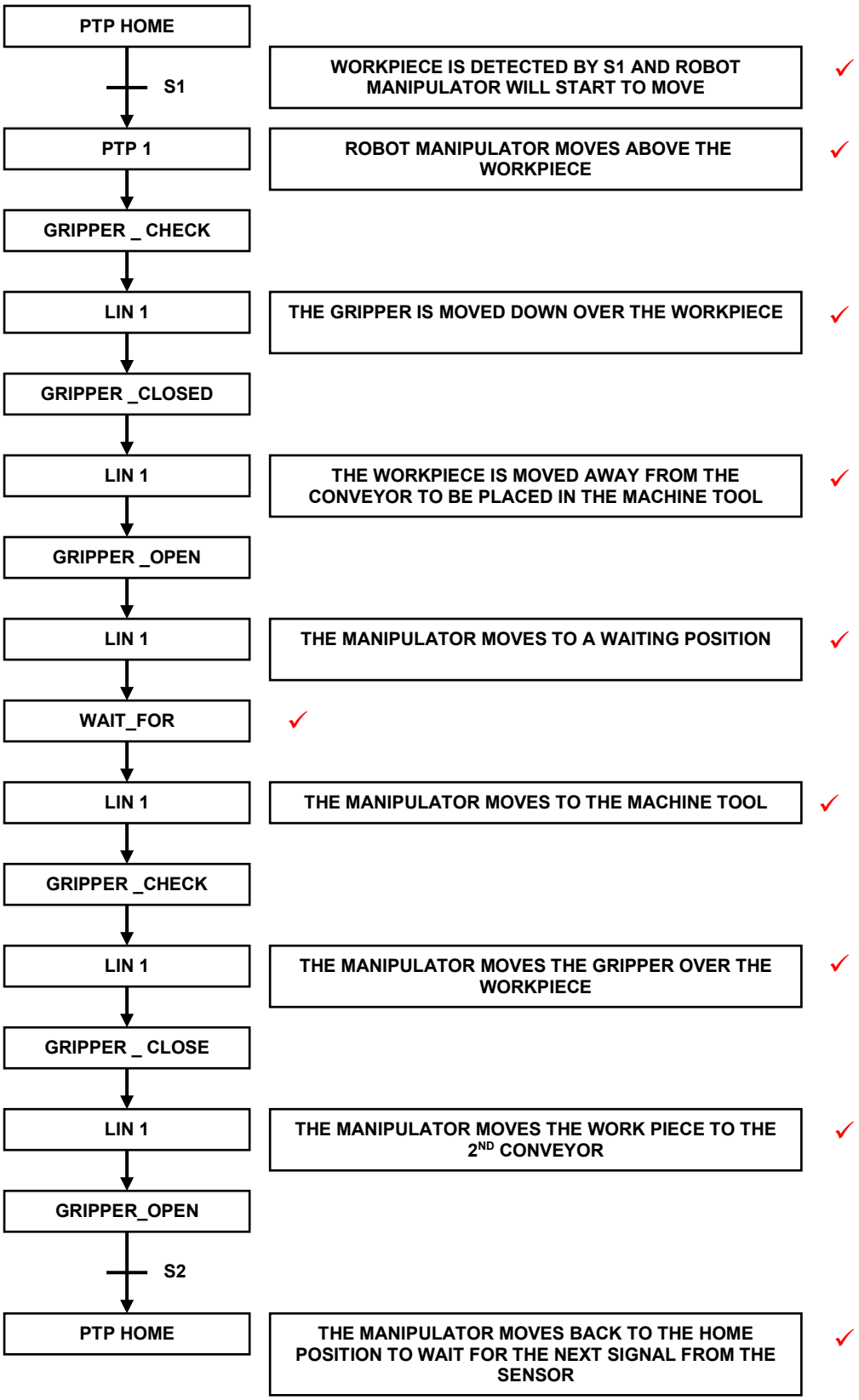
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3.2
- There must be at least two people present when working with a robot system (buddy system).
- The electrical system must be checked before energising the robot for the first time.
- Never work on a robot system unless you have been authorised to do so.
- Never disarm or deactivate any safety devices.
- Report any broken or damaged parts of the robot system.
- Make use of safety glasses or shields when working with welding type end-effectors.
- Never leave a robot system unattended, but ensure that it is turned off first.
- Never enter the work envelope unless the robot system has been put in manual/teach mode for maintenance or program development or program touch-ups.
- Consider the robot work envelope when programming it.
- Ensure that all pinch points are considered.
- Ensure that housekeeping is adhered to on a regular basis. (Any 4 × 1) (4)

3.3
- PTP – point-to-point motion:✓ where the motion path is undefined
- LIN – linear motion:✓ where the motion path is in a straight line
- CIRC – circular motion:✓ where the motion path follows a programmed curvature (3)

3.4 INI (*Program Name*)✓
; *(The robot will not respond to the semi-colon)*
; *(Information statement can be written here*)✓
P0 PTP HOME *(This command will move the robot to a programmed park position)* ✓
P1 PTP (first motion to overcome wrist alignment) ✓
. (The structure of the program code is inserted here) ✓
. .
Pn PTP HOME (The robot is returned to the programmed park position)✓ (6)

3.5



(10)

3.6 The cyclic time for 1 operation is as follows:

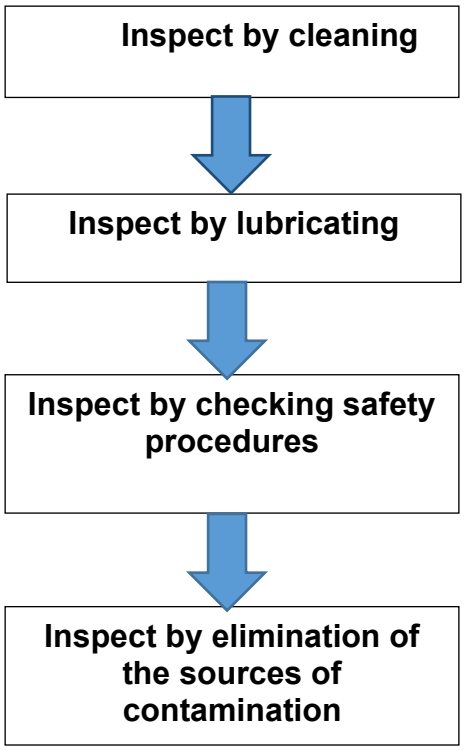
10,5 + 62 + 8 + 4,5 = 85 seconds or 1 min 25 s) (3)

[30]

QUESTION 4

4.1
- Mechanical breakage due to excessive forces and shocks
- Quick dulling by plastic deformation due to intensive stresses and temperatures
- Gradual wear of the cutting tool at its flanks and rake surface (3)

4.2



✓ ✓ ✓ ✓

(4)

4.3
- Quality refers to being free from defects, deficiencies and significant variations✓ brought about by strict and consistent commitment to certain standards
- to achieve conformance of a product in order to satisfy specific design✓ requirements with precision and high repeatability every time.✓ (3)

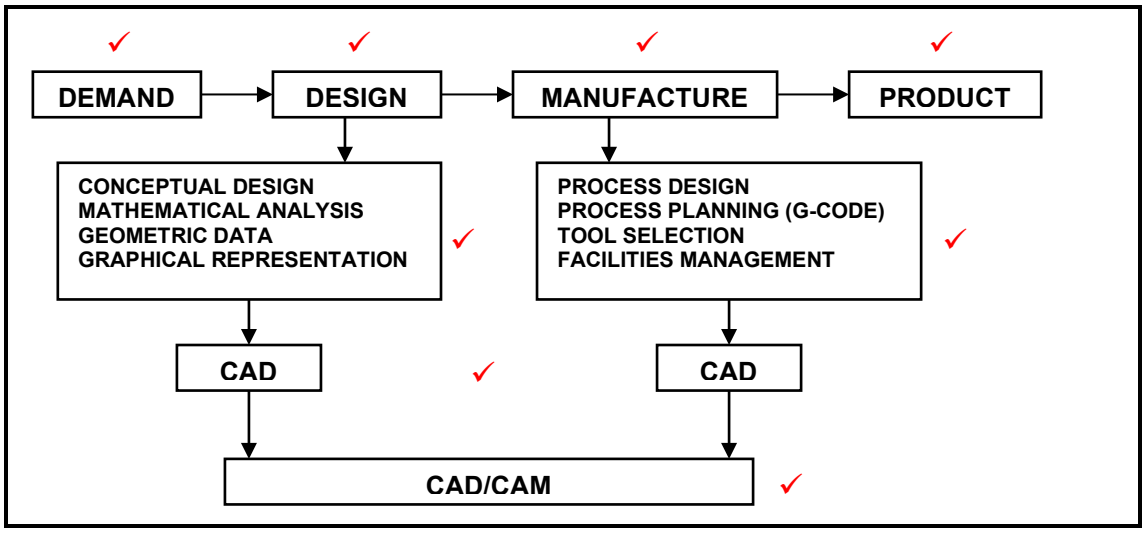
[10]

QUESTION 5

5.1 He/she should be able to check:

- The system operation when a new system is commissioned
- When the system has malfunctioned and a repair has been carried out
- When a small part has to be produced so as to carry out a repair on a machine or processing system that has malfunctioned (3)

5.2



(8)

5.3 The output of a:

- CAD system is the physical drawing of the design
- CAM system is the physical manufactured component of the design

(2 × 2) (4)

[15]

TOTAL: 100

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