higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# MARKING GUIDELINE

## NATIONAL CERTIFICATE (VOCATIONAL)

## COMPUTER-INTEGRATED MANUFACTURING
## NQF LEVEL 4

## 20 November 2024

**This marking guideline consists of 7 pages.**

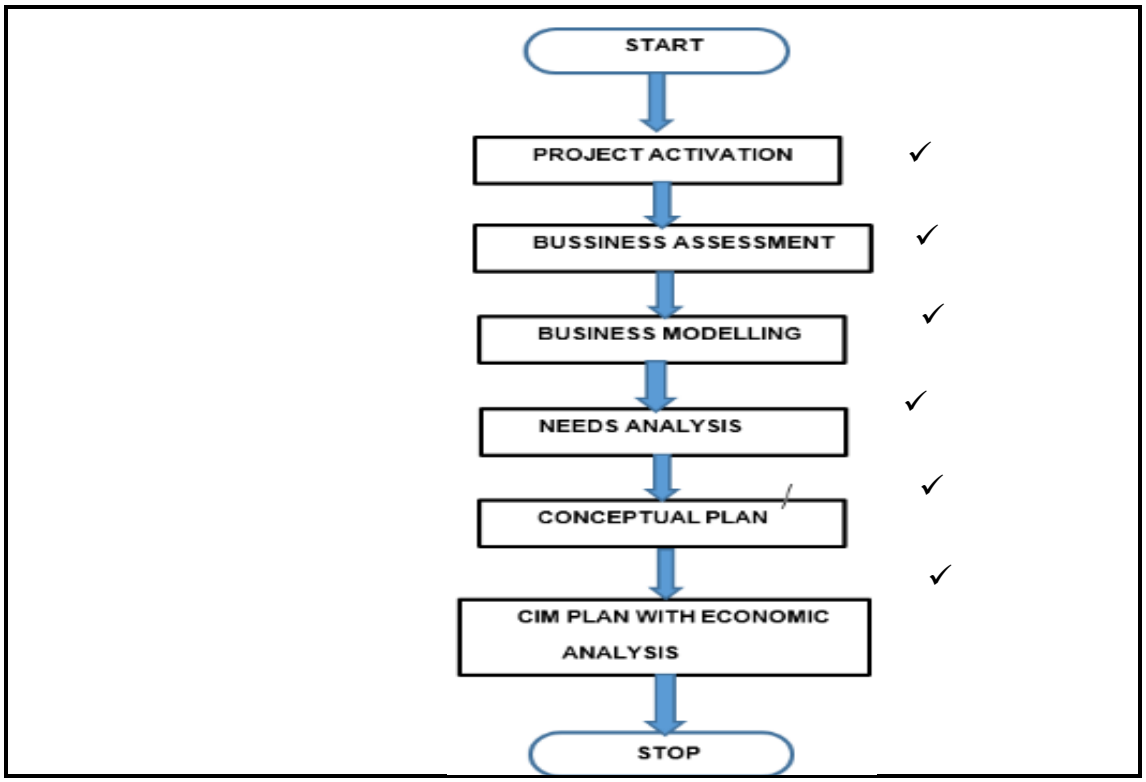
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## QUESTION 1

1.1 Computer-Integrated Manufacturing is the manufacturing approach where computers are used to control and manage the whole production process.✓✓
(1 × 2) (2)

1.2
- CNC machines
- Robotic work cells
- DNC/FMS systems
- Tool-handling systems
- Material-handling systems (Any relevant answer)✓✓✓ (Any 3 × 1) (3)

1.3




(Marker to use discretion)(6 × 1) (6)

1.4 1.4.1 The Flexible Management System (FMS) is a system that can be adapted/modified to improve quality.✓✓

1.4.2 The Distributed Numerical Control (DNC) system consists of NC programs that are managed by a production database.✓✓
(2 × 2) (4)
**[15]**

## QUESTION 2

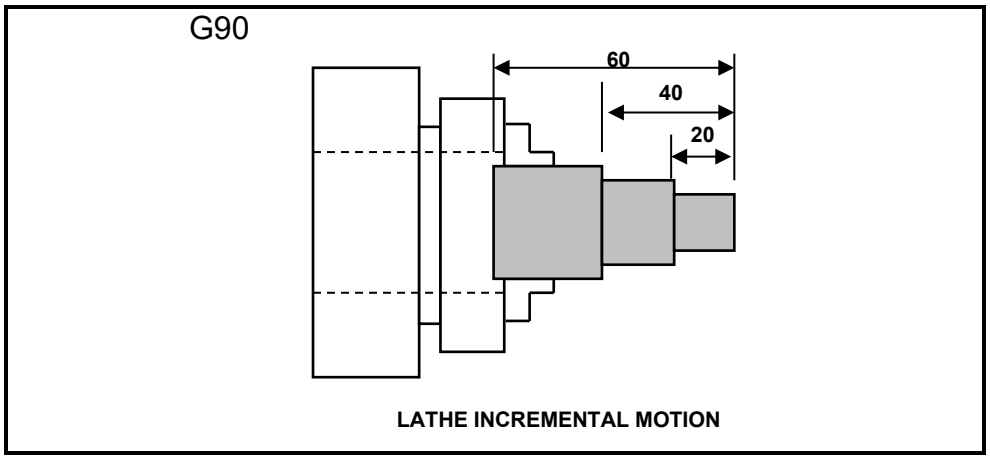
2.1 2.1.1 G-codes (Geometric codes) are the most common codes used in the CNC programming language that is used to drive computer-controlled machinery in manufacturing.✓✓ (1 × 2) (2)

2.1.2 M-codes are used for miscellaneous machine functions such as starting and stopping a CNC machine.✓✓ (1 × 2) (2)

2.1.3 Technical codes are the codes that manage the speed, feed and coolant amongst other things in a CNC programme.✓✓ (1 × 2) (2)

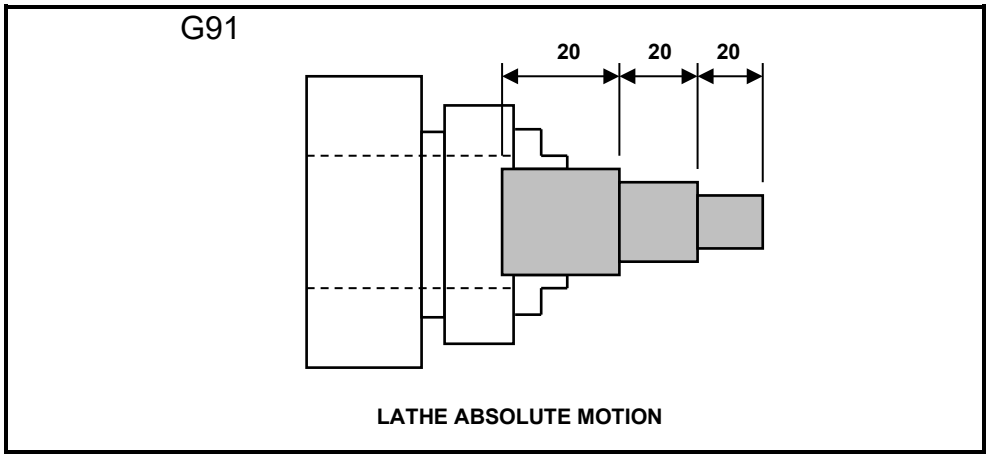
2.2 The tool path is the trajectories the cutting tool will follow during the machining process to get clean and precise parts.✓✓ (1 × 2) (2)

2.3 2.3.1 G90



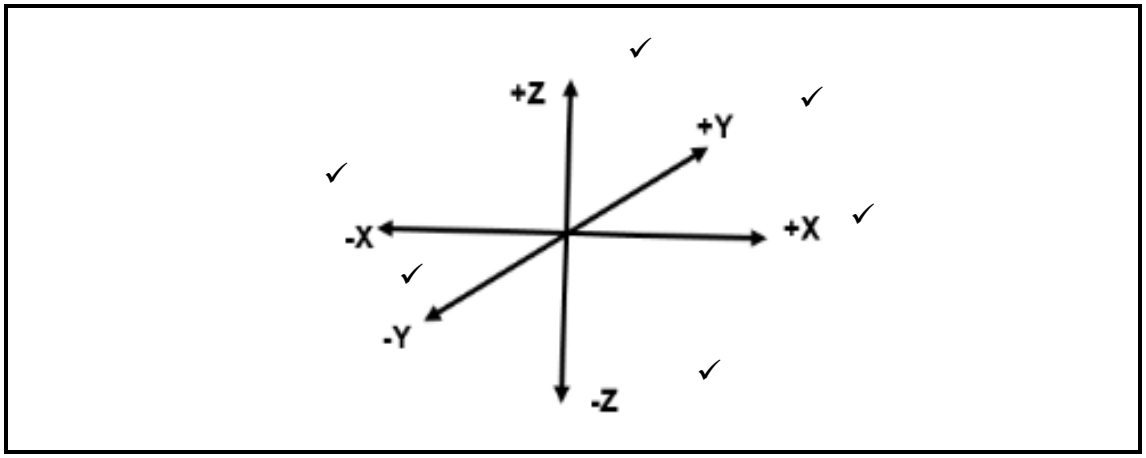

(Marker to use discretion) (THREE marks ✓✓✓) (3 × 1) (3)

2.3.2 G91




(Marker to use discretion)(THREE marks✓✓✓) (3 × 1) (3)

2.4




(6 × 1) (6)

2.5 2.5.1 G00 – Rapid non-cutting movements✓✓

2.5.2 G01- Used for linear cutting movements✓✓

2.5.3 G02 – Used for circular movements✓✓

(3 × 2) (6)

2.6 The CNC machine will not start if the door is open due to the operator safety factor built into the CNC machine tool.✓✓ (1 × 2) (2)

2.7
- Solidworks✓
- Autocad✓
- Fusion 360
- linuxCNC
- inkscape
- Mach3
- Fanuc
- Siemens

(Any relevant 2 × 1) (2)

**[30]**

**QUESTION 3**

3.1
- A Cartesian robot has three degrees of motion (XYZ).✓✓
- The Articulated robot system makes use of six degrees of freedom - three degrees (XYZ) of freedom plus another three, known as the pitch, yaw and roll that form the wrist.✓✓

(2 × 2) (4)

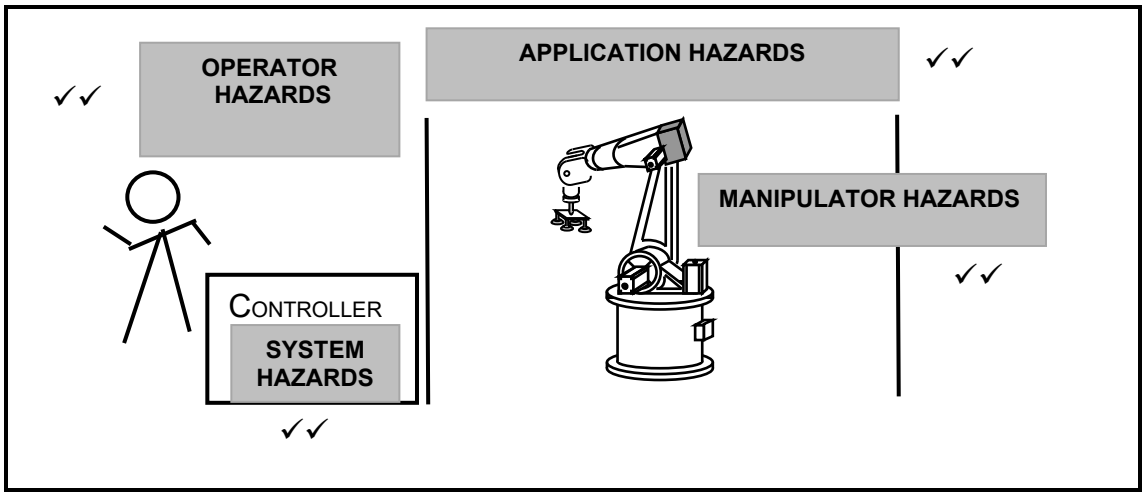
3.2
- Spot/MIG/TIG welding
- Water cutting
- Palletising
- Material handling
- Glueing
- Painting
- Machine tending
- Pick and place
- Assembly
- Grinding/deburring/polishing
- Spraying

(Any relevant 5 × 1) (5)

3.3 The robot manipulator moves the end effector to the position to do the work.✓✓ (1 × 2) (2)

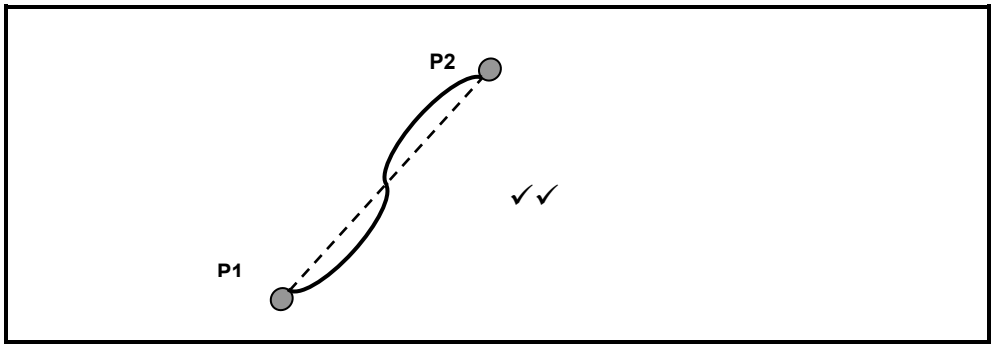
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3.4



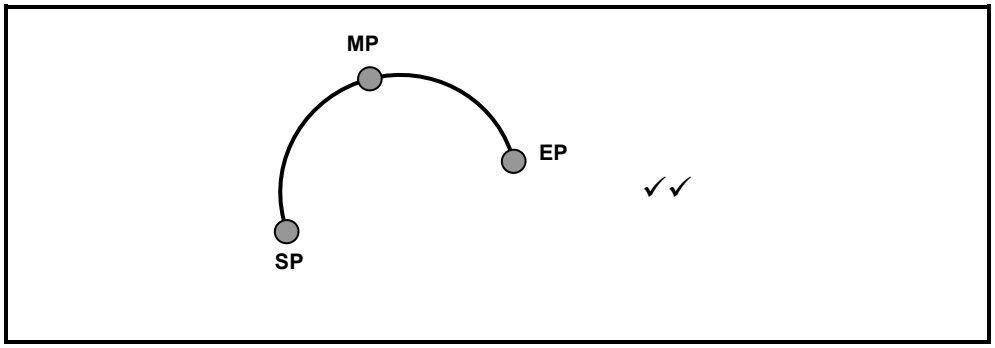

(Marker to use discretion)(4 × 2) (8)

3.5 3.5.1



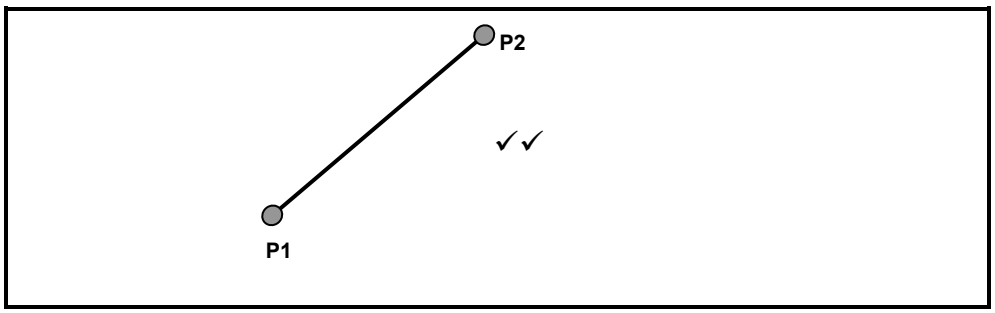

(1 × 2) (2)

3.5.2



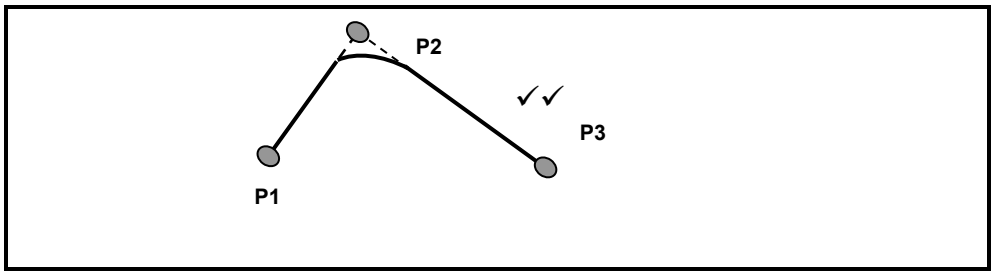

. (1 × 2) (2)

3.5.3




(1 × 2) (2)

3.5.4




(1 × 2) (2)

3.6
- Motion commands
- Digital commands (I/O)
- Technical commands (OPEN/CLOSE- SUCTION ON/SUCTION OFF) (3)

**[30]**

## QUESTION 4

4.1
- Process control
- Charts
- Acceptance sampling
- Product quality control (4)

4.2
- Quality planning
- Quality control
- Quality assurance
- Quality improvement (4)

4.3 Quality is mainly conformance to specifications.✓✓ (1 × 2) (2)

**[10]**

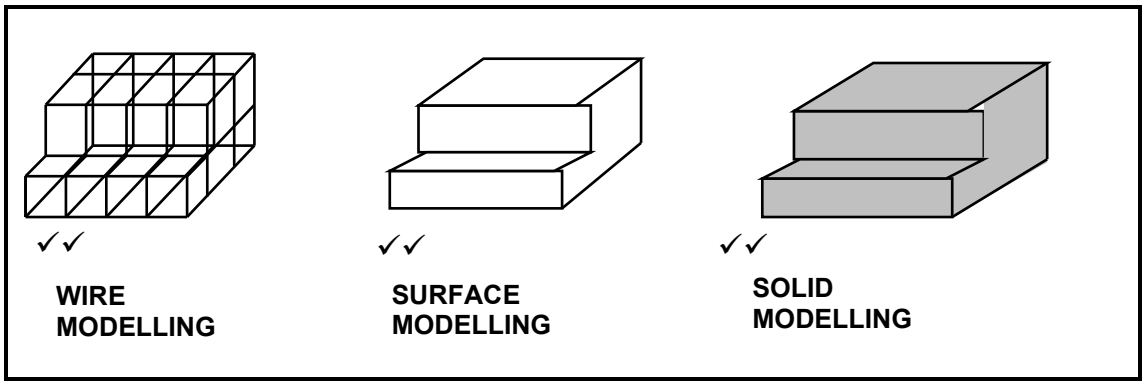
## QUESTION 5

5.1 A CAD/CAM system automatically converts a design into a process plan to produce a product.✓✓ (1 × 2) (2)

5.2
- The CAD system produces a drawing.✓✓
- The CAM system produces a product.✓✓ (2 × 2) (4)

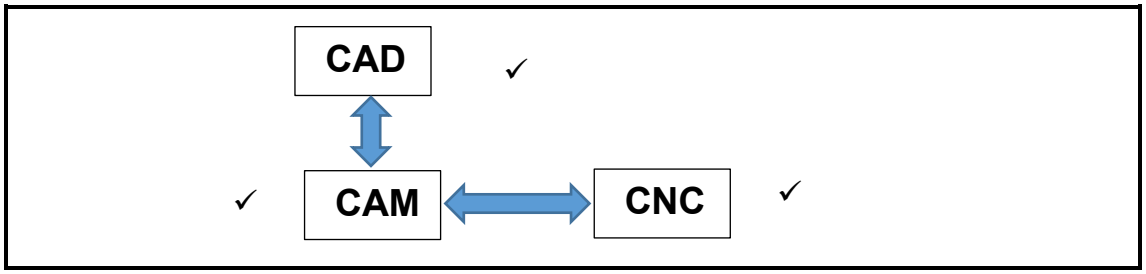
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5.3




(Marker to use discretion) (3 × 2) (6)

5.4




(Marker to use discretion) (1 × 3) (3)

**[15]**

**TOTAL: 100**

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