higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

STORED PROGRAMME SYSTEMS
NQF LEVEL 3

8 December 2020

This marking guideline consists of 6 pages.

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QUESTION 1

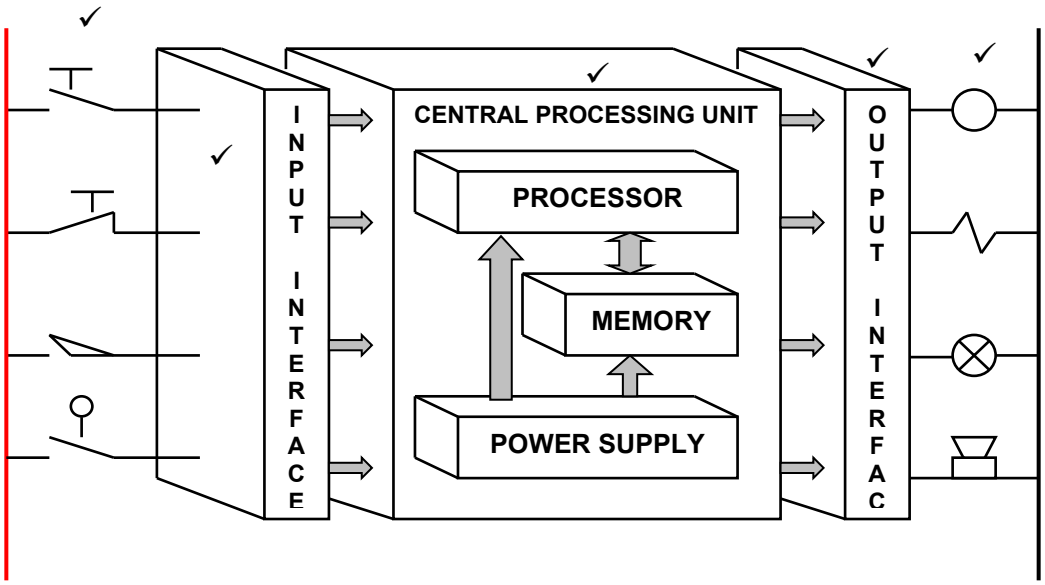
1.1
- Flexible
- Cost effective
- Efficient (3)

1.2
- Unemployment rate increases due to machines replacing humans
- Technical limitation: Current technology cannot automate all desired tasks
- Security threats/Vulnerability: Automated systems may have a limited level of intelligence and therefore are susceptible to errors.
- Unpredictable development costs: The research and development cost of automating a process may exceed the cost saved by the automation itself.
- High initial cost: The automation of a new product or plant requires a huge initial investment in comparison with the unit cost of the product.

(Any 2 × 1) (2)

1.3
- Logic
- Sequencing
- Timing
- Counting
- Arithmetic (Any 1 × 1) (1)

1.4



(5)

1.5
- Number and types of input and output points required
- Size and type of memory required
- Speed and power required of CPU and instruction set
- Manufacturer's support and backup (4)

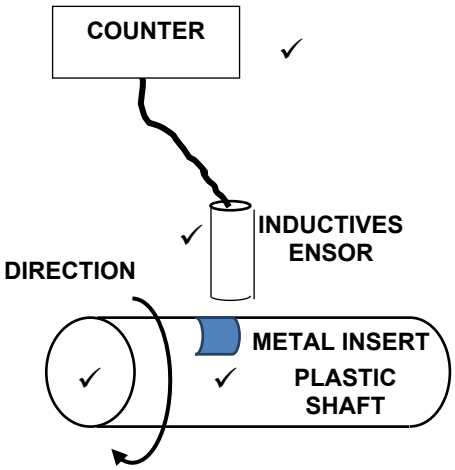
[15]

QUESTION 2

2.1
- Proximity
- Distance and displacement
- Force and pressure (3)

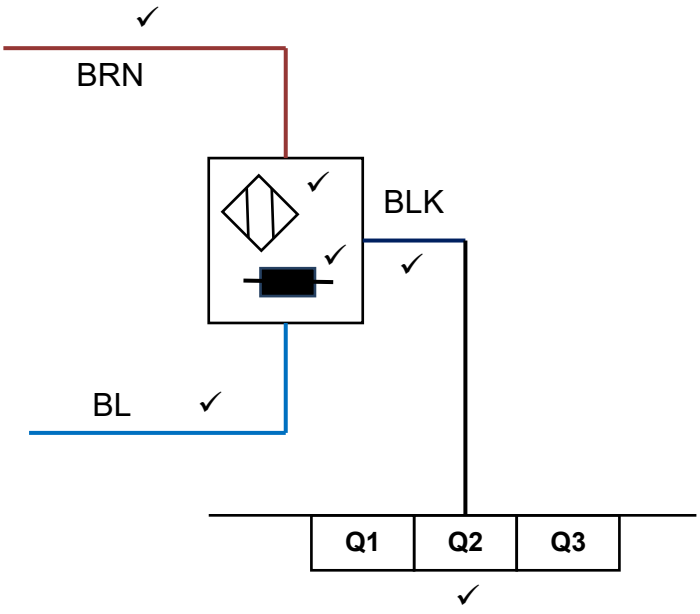
2.2
- Digital signals
- Discrete signals
- Analogue signals (3)

2.3



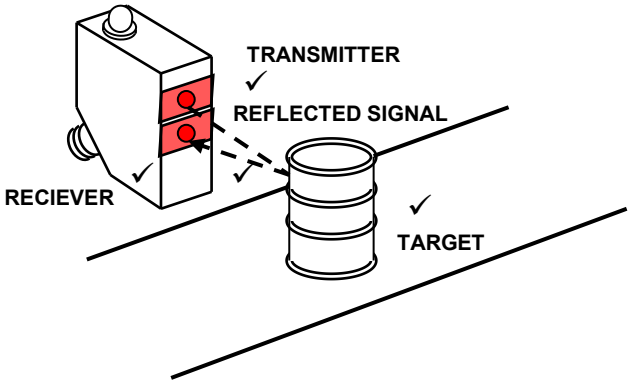
(4)

2.4



(6)

2.5



(4)
[20]

QUESTION 3

3.1

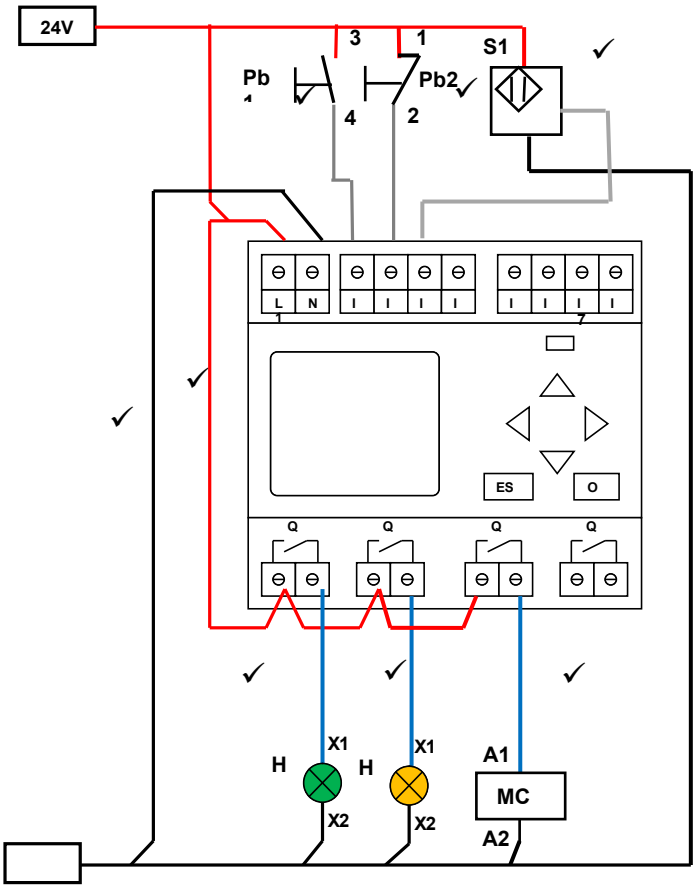
- Pb1 is used to start the application and is latched via the contact CR1.1 of the control coil (CR1).✓
- The back contact CR1.2 controls the green lamp 1 when in standby mode and the CR1.3 controls the amber lamp 2.✓
- CR1.4 starts the DC motor (M1), controlled by counter CU1 after a count of 5.✓
- CR1.5 and counting sensor S1 will energise CU1 which will turn off the dc motor M1
- CR1.6 and CU1.2 will energise T1 after 10s CU1 will be de-activated and CU1.1 turns off M1.
  OR
- T1 will turn the DC motor M1 on again after a certain time has elapsed.✓ (4)

3.2 3.2.1

ITEM	DESCRIPTION	MARKING	APPLICATION	ADDRESS
1	PUSHBUTTON (NO) GRN	PB1	START APPLICATION	I1
2	PUSHBUTTON (NC) RED	PB2	STOP APPLICATION	I2
3	GREEN INDICATION LAMP 24V	H1	STANDBY INDICATION	Q1
4	AMBER INDICATION LAMP 24V	H2	RUN INDICATION	Q2
5	RELAY 24V COIL 6 CONTACT SET	MCR	MOTOR CONTROL	Q3
6	12 -30VDC INDUCTIVE SENSOR	S1	COUNTING SENSOR	I3
7	POWER SUPPLY 220V/24VDC 1.3A	P/S	SUPPLY CONTROL POWER	----------
8	LOGO 8I/4O	PLC	APPLICATION CONTROLLER	----------

(8)

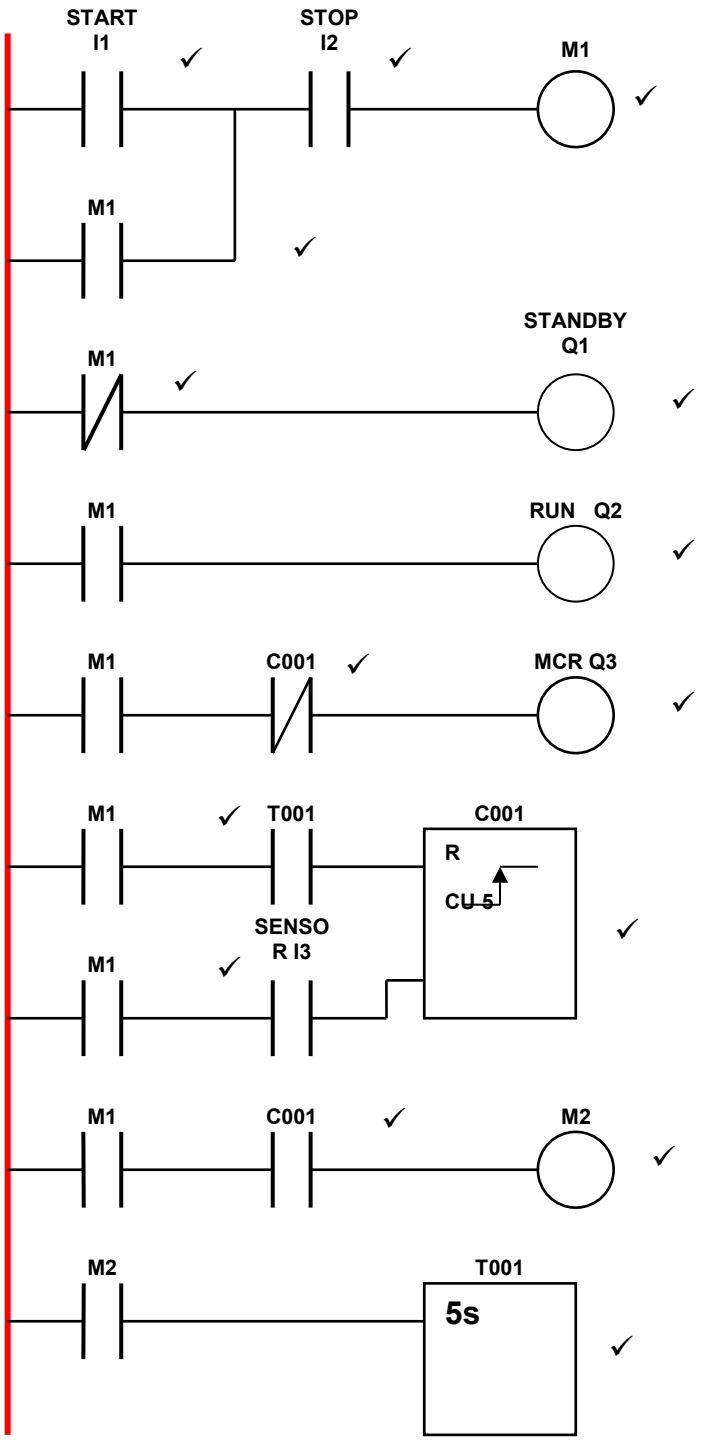
3.2.2



(8)
[20]

QUESTION 4

4.1



(15)

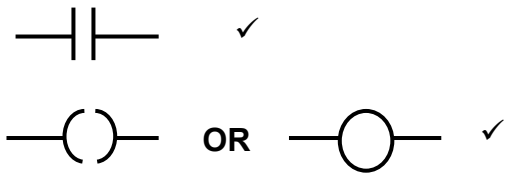
4.2
- To make product changes easier and waste less time
- To reduce changes in the production machinery when making product changes
- Programming a PLC makes product changes cheaper
- To remain competitive in the manufacturing environment (4)

4.3
- Statement list
- Instruction list (2)

4.4
- AND
- OR
- SR – Latching
- NOT (3)

4.5
- Time-based control is achieved by means of special relays such as timers and counters.
- Event-based control is achieved by means activation of a push-button or detection by a sensor. (2 × 2) (4)

4.6



(2)
[30]

QUESTION 5

5.1 If the red diagnostic LED flashes at start-up, it indicates that there is a shortage or an overload. You must check if the power supply can meet the circuit requirements. (2)

5.2 The constant green LED means there is good communication between the I/O interfaces. (2)

5.3 The constant amber LED means the CPU is operating correctly. (2)

5.4 If the power supply makes a whistling sound or the power LED goes out, it means there a short-circuit in the wiring. (2)

5.5 If the input LED on the PLC interface is not illuminated when a push-to-break push-button is wired to the PLC, there must be a broken wire or loose connection. (2)

5.6 The working/main circuit (2)

5.7
- No energy/electricity/power source
- Working circuit not switched on
- Wire could be broken
- Loose connection/terminal
- Dirty MCR contacts
- Faulty motor (Any 3 × 1) (3)

[20]

TOTAL: 100

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