Faculty Name: IT
Qualification Name: Programming Robotic Development: RD412

Formative Assessment 1 Question Paper

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Table of Contents

Formative Assessment 1 Paper

Faculty Name:	Information Technology
Qualification Name:	IT Certificate in Programming Foundation
Module Name:	Robotic Development Semester 1
Module Code:	RD412
Hand Out:	08/03/2024
Hand In:	22/03/2024
Time:`	23:30
Total Marks:	100
Examiner:	Mr Kobus Mienie
Resources Required:	None

Section A: Multiple Choice Question(s)	20 Marks
Section B: Long Question(s)	80 Marks

Instruction(s) to Students

1. Read all instructions carefully before beginning the assessment.
2. Use only the materials provided to you, including supporting materials if necessary.
3. Write your name and any required information on the answer booklet or answer sheet.
4. Read each question carefully and make sure you understand what is being asked.
5. Manage your time carefully and pace yourself throughout the hand in and hand out dates.
6. Show all work and clearly label your answers.
7. All Formatives are due 23:30
8. Use correct grammar, spelling, and punctuation.
9. When you have finished the assessment, check your work to make sure you have answered all questions to the best of your ability.

Section A

Multiple Choice Question(s) 20 Marks

Question 1

1.1. The term PLC stands for: (2)
A. Personal logic computer

B. Programmable local computer

C. Personal logic controller

D. Programmable logic controller

1.2. Decide whether each of these statements is true (T) or false (F): A transistor output channel from a PLC
(i) Is used for only DC switching. (2)

(ii) Is isolated from the output load by an optocoupler.
Which option best describes the two statements?
A. (i) True (ii) True

B. (i) True (ii) False

C. (i) False (ii) True

D. (i) False (ii) False

1.3. Decide whether each of these statements is true (T) or false (F): A relay output channel from a PLC:
(i) Is used for only DC switching. (2)

(ii) Can withstand transient overloads.
Which option best describes the two statements?
A. (i) True (ii) True

B. (i) True (ii) False

C. (i) False (ii) True

D. (i) False (ii) False

1.4. Decide whether each of these statements is true (T) or false (F): A triac output channel from a PLC:
(2)

(i) Is used for only AC output loads.

(ii) Is isolated from the output load by an optocoupler.

Which option best describes the two statements?
A. (i) True (ii) True

B. (i) True (ii) False

C. (i) False (ii) True

D. (i) False (ii) False

1.5. A diaphragm pressure sensor is required to give a measure of the gauge pressure present in a system. Such a sensor will need to have a diaphragm with: (2)
A. A vacuum on one side.

B. One side open to the atmosphere.

C. The pressure applied to both sides.

D. A controlled adjustable pressure applied to one side.

1.6. The change in resistance of an electrical resistance strain gauge with a gauge factor of 2.0 and resistance 100 Ω when subject to a strain of 0.001 is: (2)

A. 0.0002 Ω

B. 0.002 Ω

C. 0.02 Ω

D. 0.2 Ω

1.7. An incremental shaft encoder gives an output that is a direct measure of: (2)

A. The diameter of the shaft.

B. The change in diameter of the shaft.

C. The change in angular position of the shaft.

D. The absolute angular position of the shaft.

1.8. A stepper motor has a step angle of 7.5°. The digital input rate required to produce a rotation of 10 rev/s is: (2)

A. 48 pulses per second

B. 75 pulses per second

C. 480 pulses per second

D. 750 pulses per second

1.9. A 12-bit ADC can be used to represent analog voltages over its input range with: (2)

A. 12 different binary numbers

B. 24 different binary numbers

C. 144 different binary numbers

D. 4096 different binary numbers

1.10. An inverting operational amplifier circuit has an input resistance of 10 kΩ and feedback resistance of 100 kΩ. The closed-loop gain of the amplifier is: (2)

A. –100

B. –10

C. +10

D. +100

[Total = 20 Marks]

Section B

Long Question(s) 80 Marks

Question 2

Convert the following numbers, the source and target will be provided in each question.
NB!!! Show all steps. A total of 2 marks will be given for the correct answer, the rest will be allocated to the correct numbering systems used and the steps taken.

2.1 Convert the following from Decimal to binary: (5)
25419

2.2 Convert the following from Hexadecimal to binary: (5)
A65

2.3 Convert the following from Octal to Decimal: (5)
2540

2.4 Convert the following from Binary to Decimal: (5)
001101

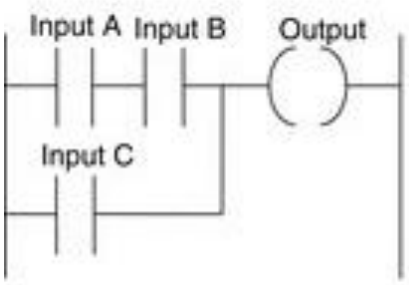
2.5 Convert the following from Binary to Octal: (5)
001101

2.6 Convert the following from Binary to Hexadecimal: (5)
001101

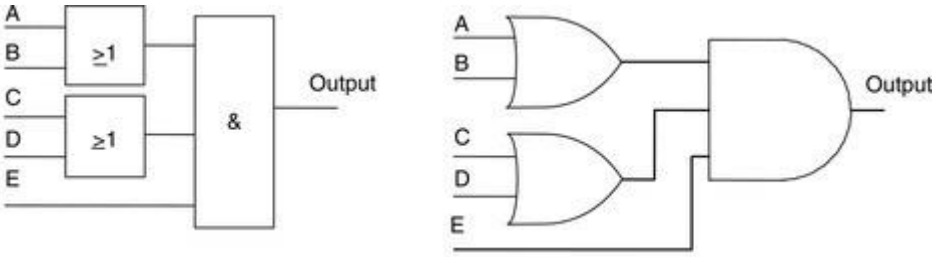
[Total = 30 Marks]

Question 3

3.1 Examine the ladder diagram and create an equivalent function block diagram. (10)



3.2 Examine the function block diagram and create an equivalent ladder diagram. (20)



3.2 Draw the function block diagrams to represent: (20)

- There is to be a motor startup when either switch A or switch B is activated.
- A motor is to be started when two normally open switches are activated and remain on, even if the first of the two switches goes off but not if the second switch goes off.
- A pump is to be switched on if the pump start switch is on or a test switch is operated.

[Total = 50 Marks]