X

Unit 3 - Week2: Technologies and devices employed in CNC machines

Assignment-2

The due date for submitting this assignment has passed. **Due on 2018-02-28, 23:59 IST.**

Submitted assignment

1) The incremental encoder is capable of sensing ***1 point***

- Direction of movement of the table
- Direction of rotation of the lead screw
- Direction of rotation of the motor
- None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
None of these

2) The function of Tachogenerator in the CNC continuous control loop is ***1 point***

- Reduction of BLU (Basic Length Unit)
- Faster response of motor
- To make 3-D interpolation possible
- None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
Faster response of motor

3) A manufacturer finds that a stepper motor is missing steps from pulse generator as the pulse rate ***1 point*** (1000 ppm) is too high. In order to bring down the pulse rate to the stepper motor to 875 ppm, a DDA (digital differential analyzer) is included (fig. 1). If the output of the DDA to the stepper motor is to be 875 ppm, the values of X (the content of p) & n should respectively be

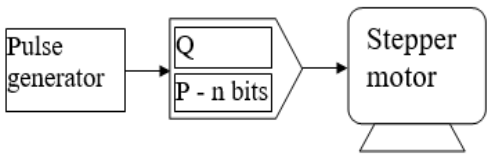

Fig. 1

- 9 and 16
- 7 and 3

Week 3: Computer aided offline programming practice, Linear and curvilinear interpolator, Tutorial

Week 4: 3-D Machining, Curved Surface Geometry and Cutter Path generation, Tutorial

Practice Assignments with their answers and explanations

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- 5 and 3
- None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
7 and 3

4) A stepper motor moves 1 step per pulse of a pulse generator. It covers 1 rotation in 200 equi-angular steps and produces a basic length unit (BLU) of 14 microns in a feed drive of a CNC unit. It is required that this BLU will have to be reduced to 7 microns. In order to achieve that, one way is to ***1 point***

- Reduce the pulse output frequency of the pulse generator to half of its present value
- Run the stepper motor in half-step mode
- Reduce the voltage level of the power supply to the stepper motor to half its present value
- None of these

No, the answer is incorrect.
Score: 0

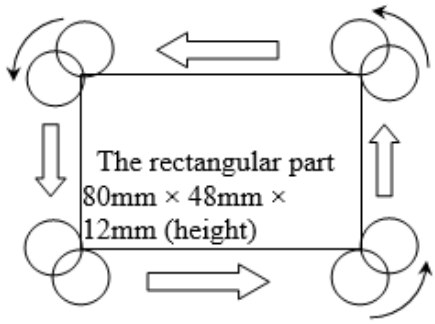
Accepted Answers:
Run the stepper motor in half-step mode

5) In a CNC machining centre, for cutting the periphery of a rectangular job (shown from top) made of Perspex (a type of plastic), application of kerosene is recommended as cutting fluid. However, the cutting fluid system of the machining centre is full of a different variety of oil and cannot be used. In this situation, a device X is designed which works as follows à ***1 point***

With start of machining, X starts applying kerosene and it also starts sending pulses at frequency f Hz to a DDA Y. DDA Y starts counting up from 0.

The moment coolant application is to be over, 1 pulse should reach from Y (overflow pulse of DDA Y) to X. On receiving this pulse, X stops applying kerosene. So, the DDA Y should be such that it sends out first overflow when machining is just over

The cutter (seen in fig as circle) is an end mill cutter with 20 teeth, 50 mm OD, with cutting speed = 30×π (m/min) and feed = 0.02 mm/tooth. Time for taking the 3 turns by the cutter at corners may be ignored.



In order to make this successful, the DDA Y should have

- X = 3 and n = 9 and f = 2 MHz
- X = 1 and n = 16 and f = 2^{10} Hz
- X = 5 and n = 8 and f = 2×10^{11} MHz
- None of these

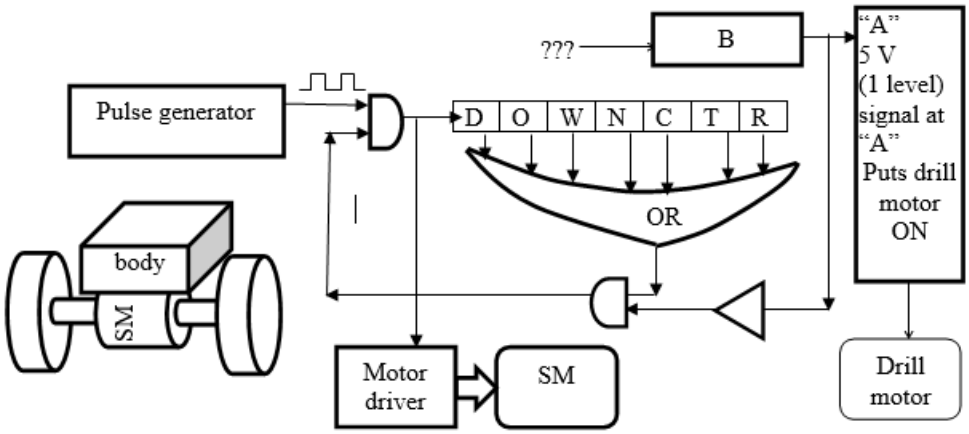
No, the answer is incorrect.
Score: 0

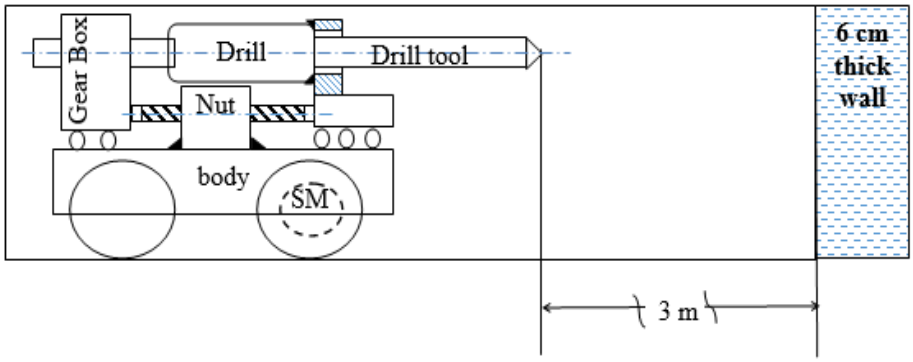
Accepted Answers:
X = 1 and n = 16 and f = 2^{10} Hz

6) Inside a pyramid, a secret blind tunnel of 8" × 8" is discovered, into which a mobile drilling robot has to be sent. ***1 point***
(you can watch this *https://www.youtube.com/watch?v=ow9TrbULwKA)*

Robot does not slip during movement. Measured from drill tip, the tunnel is 3 m long, ending in a 60 mm thick wall, in which, a hole has to be drilled for camera entry. For the robot control, the following circuit is made. High logic level voltage is 5 V (**also referred as 1**) and low is 0 V.

Data:
Wheel diameter = 64.5 mm, Stepper motor “SM” mounted on wheel axis so that stepper motor rpm = Wheel rpm. Stepper motor moves 1 step of 1.8 degrees per voltage pulse from pulse generator (Pulse frequency 90 ppm)
Drill motor (**500 rpm**) connected to lead screw of 0.5 mm pitch via gear box of ratio 1/10. Nut connected to body. Hence on **drill motor rotation**, drill rotates and drilling head moves forward on rollers with feed w.r.t body due to screw-nut motion. Stepper motor SM will electromagnetically lock wheels during drilling and prevent rolling back of robot due to drilling thrust.





The robot has to move forward on its wheels, stop and then drill the wall by movement of the drilling head. The speed of the robot on its wheels is nearest to (in mm/min)

- 20.59
- 148.81
- 91.18
- None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
91.18

7) The BLU of the movement of the robot on its wheels (movement per pulse) is nearest to (in µms) ***1 point***
(Refer to the data and figures of question 6)

- 10.13
- 101.3
- 1013
- None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:

1013

8) The machine requires that at start, the distance between wall and drill tip be entered into the position down counter in number of BLUs, expressed in binary. In that case, the number, after rounding off in decimals would be nearest to
(Refer to the data and figures of question 6) **1 point**

- 3000
- 2993
- 3039
- None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
2993

9) The circuit B is supposed to send an output of 1 to circuit A when the distance between the drill tip and wall is 7 BLU or less. Assume the downcounter to have 7 bits, containing d, o, w, n, c, t, r as shown. In that case, the circuit of B should be
(Refer to the data and figures of question 6) **1 point**

- d'.o'.w'.n'
- c' + t' + r'
- d + o + w + n
- None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
d'.o'.w'.n'

10) The feed in mm/min during actual drilling is nearest to (in mm/min):
(Refer to the data and figures of question 6) **1 point**

- 100
- 50
- 25
- None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
25

Previous Page End