Assignment-2

The due date for submitting this assignment has passed. Due on 2016-09-23, 22:00 IST.

Submitted assignment

1) Advantage(s) of stepper motor over permanent magnet Direct current (PMDC) motor is / are (within specified operating limits)

- No power is required to drive the stepper motor, whereas power is required to drive PMDC motor
- The extent of rotation of output shaft of stepper motor can be controlled precisely without feedback while it is not so in case of PMDC motor
- Stepper motors can rotate in both directions but PMDC motors can only rotate in one direction
- None of the others

No, the answer is incorrect.
Score: 0

Accepted Answers:
The extent of rotation of output shaft of stepper motor can be controlled precisely without feedback while it is not so in case of PMDC motor

2) A PMDC motor starts up from rest in response to a step voltage $V$ applied across its terminals at time $t=0$. If angular velocity of motor shaft $\omega$ is related to $V$ as (k and $\tau$ are constants)

$$\omega = \frac{V}{k} \left(1 - e^{\frac{t}{\tau}}\right)$$

- Variation of $\omega$ will be sinusoidal with time
- $\omega$ will be equal to $\frac{V}{k}$ at steady state ($t = \infty$)
- $\omega$ will reach a constant value at $t = \tau$
- None of the others

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\omega$ will be equal to $\frac{V}{k}$ at steady state ($t = \infty$)

3) A digital differential analyzer (DDA) is getting an input pulse frequency of $f$ Hertz and sending output overflow pulses $Z$ at the rate of 300 Hertz (Fig. 1). It is having 4 bit counters P and Q (n = 4). The counter shown as P contains a number $X = 3$ (= 11 in binary), which is added repeatedly to the contents of counter Q.

If the output overflow pulse rate of the DDA is given by $f_{DDA} = \frac{f \times 2^n}{2^4}$, the value of $f$ in Hertz is
4) The CBI (Central Bureau of Investigation) has embedded 1 chip each into the bodies of three ATM robbers P, Q, and R and has set them free. The chips are emitting continuous wireless signals p, q, and r respectively. If a receiver is located within a distance of 1 km of a robber P, it will pick up his wireless signal p and develop a digital output signal \( p_1 = 1 \). If it does not pick up the signal, then it develops \( p_1 = 0 \). The same receiver works simultaneously in the same way for Q and R and develops similar binary output signals \( q_1 = 1 \) (if it picks up signal q), otherwise \( q_1 = 0 \) and \( r_1 = 1 \) (if it picks up signal r), otherwise \( r_1 = 0 \). The CBI needs an ALARM in the form of a digital signal \( M = 1 \) if at least two of those ATM robbers are together within a radius of 1 km of any particular ATM. In all other cases, \( M = 0 \). All ATMs are equipped with receivers. \( M \) can be obtained as the output of the following digital circuit, if it be posted at each ATM with \( p_1, q_1, \) and \( r_1 \) as inputs:

\( p_1 + q_1 + r_1 \)
\( p_1 \cdot q_1 \cdot r_1 \)
\( p_1 \cdot q_1 + q_1 \cdot r_1 + p_1 \cdot r_1 \)
None of the others

No, the answer is incorrect.
Score: 0
Accepted Answers:
1600

5) Milling operation is taking place on a CNC milling machine. From the signals received from a grey code absolute encoder mounted on the rotating lead screw of the X-axis feed drive of the CNC milling machine, it is possible to

Detect whether upmilling / downmilling is taking place
Detect the direction of rotation of the lead screw of the X-axis feed drive
Detect the direction of rotation of cutter
None of the others detections are possible

No, the answer is incorrect.
Score: 0
Accepted Answers:
Detect the direction of rotation of the lead screw of the X-axis feed drive

6) Holes have to be drilled on the part shown, with equi-angular spacing on the circumference of a circle about the centre C (Fig. 2) on a CNC drilling machine having an X-Y table. The drill is mounted on the vertical drill spindle by automatic tool changing and the workpiece is placed on the X-Y table whose movements are programmable in X and Y directions.
axes. Drilling has to be carried out by CNC program execution and no manual intervention is permitted. In such a case

CNC circular interpolation is necessary
- The programmable X-Y table is sufficient for taking the drill to all hole locations
- The programmable X-Y table is not sufficient and a CNC rotary table is necessary
- None of the others
- An indexing head is necessary

No, the answer is incorrect.
Score: 0
Accepted Answers:
The programmable X-Y table is sufficient for taking the drill to all hole locations

7) A recirculating ball screw-nut mechanism is used in the feed drive of a CNC continuous control system for

- Reducing machining time
- Eliminating or reducing backlash in lead screw-nut pairs
- Increasing cutting speed
- None of the others

No, the answer is incorrect.
Score: 0
Accepted Answers:
Eliminating or reducing backlash in lead screw-nut pairs

8) In a remote controlled wheeled robot for defusing of bombs, a stepper motor is employed for getting rotation of

- Reducing machining time
- Eliminating or reducing backlash in lead screw-nut pairs
- Increasing cutting speed
- None of the others

No, the answer is incorrect.
Score: 0
Accepted Answers:

Given that one angular step of motor takes place for one pulse and 200 angular steps making one rotation of motor shaft. In such case, the minimum number of bits p counter should have is

- 4
- 3
- 2
- 8
- None of the others

No, the answer is incorrect.
Score: 0
Accepted Answers:
3
9) In CNC milling, the length of cutter protruding from spindle and the height of the part above table surface can be made known to the machine controls by

- Declaration of cutter diameter offset
- Declaration of Mirror imaging command
- Declaration of cutter length offset
- None of the others

No, the answer is incorrect.
Score: 0
Accepted Answers:
Declaration of cutter length offset

10) In printed circuit motor, the polar moment of inertia is reduced by

- Using and electronic control circuit on PCB (printed circuit board) inside the motor which electronically reduces moment of inertia
- Replacing the rotor (which has heavy copper coils) by a thin, disc shaped permanent magnet rotor
- Replacing the rotor (which has heavy copper coils) by a plastic armature with aluminium wires replacing heavy copper coils
- None of the others

No, the answer is incorrect.
Score: 0
Accepted Answers:
Replacing the rotor (which has heavy copper coils) by a plastic armature with aluminium wires replacing heavy copper coils