

Unit 10 - Week 8

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Assignment 8

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-11-11, 23:59 IST.

1) The voltages at the midpoints of each leg of an inverter which feeds a PM synchronous motor, are described by approximate expressions as given below. (This neglects the high frequency ripple.)

$$\begin{aligned}v_{ro} &= 12 + 10\cos(100\pi t), \\v_{yo} &= 12 + 10\cos(100\pi t - 2\pi/3), \\v_{bo} &= 12 + 10\cos(100\pi t - 4\pi/3)\end{aligned}$$

As clear from the expressions, each pole voltage has a DC component and an alternating component. Determine the effective magnitude of DC component of each phase current when this set of voltages are applied across the motor. Each phase winding of the motor has a resistance of 0.3 Ω .

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 0

1 point

2) In the PWM scheme employed for a PMSM drive,

- the reference is a low frequency sinusoid and the carrier is a high frequency triangular waveform
 the reference is a sinusoid and the carrier is a triangular waveform, both of same frequencies
 the reference is a constant signal and the carrier is a sinusoidal waveform
 the reference is a low frequency triangular waveform and the carrier is a high frequency sinusoid

No, the answer is incorrect.
Score: 0

Accepted Answers:
the reference is a low frequency sinusoid and the carrier is a high frequency triangular waveform

1 point

3) Consider two different requirements of actuating mechanisms: (A) requires an inverter which handles 48V DC input and a high frequency of switching (50 kHz). (B) requires an inverter which handles 600 V DC input and comparatively lower frequency of switching (2 kHz). For these applications, the preferable switching devices of the converter are

- IGBT for (A) and MOSFET for (B)
 IGBT for (B) and MOSFET for (A)
 IGBT for (A) and (B)
 MOSFET for (A) and (B)

No, the answer is incorrect.
Score: 0

Accepted Answers:
IGBT for (B) and MOSFET for (A)

1 point

4) A field controller is used in the control loop of PMSM drive in order to

- ensure that the magnetic field generated by the stator windings does not affect the rotor magnetic field
 modulate the level of magnetic field in the machine according to the load
 compensate the reduction of field happening inside the machine due to thermal variations
 add an additional magnetic field to the system so that the net magnetic field inside the machine is increased

No, the answer is incorrect.
Score: 0

Accepted Answers:
ensure that the magnetic field generated by the stator windings does not affect the rotor magnetic field

1 point

5) For the requirement of a certain robotic actuation, a student identifies four prospective candidate motors of the same ratings - Induction motor, BLDC, PMSM and a PMDC motor. Among these variants, the largest motor is likely to be

- PMSM
 BLDC
 Induction motor
 PMDC motor

No, the answer is incorrect.
Score: 0

Accepted Answers:
PMDC motor

1 point

6) A DC tachogenerator has a resolution of 0.1 V/(rad./s). If the shaft of the motor to which the tachogenerator is coupled rotates at 200 rpm, determine the output voltage of the tachogenerator in V. Do the calculations correct to 1 decimal place

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 1.9,2.1

1 point

7) Each phase of an AC tachogenerator is observed to generate alternating output voltage signals each of amplitude E and frequency f while the shaft rotates at a certain speed. Now, if the shaft speed is doubled, the output signal from the sensor will be an

- alternating voltage of amplitude E and frequency 2f
 alternating voltage of amplitude 2E and frequency f
 alternating voltage of amplitude 2E and frequency 2f
 alternating voltage of amplitude 2E and frequency f/2

No, the answer is incorrect.
Score: 0

Accepted Answers:
alternating voltage of amplitude 2E and frequency 2f

1 point

8) A 2500 PPR incremental encoder is used for a certain robotic application. It is measured that the output pulses coming from one channel of the encoder is at a frequency of 5 kHz. The speed of the rotor in rpm is _____.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 120

1 point

9) The number of divisions (related to any one channel) in the circular disc of a 2500 PPR incremental encoder is _____.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 2500

1 point

10) The smallest angular variation, correct to 4 decimal places, that can be measured by a 10 bit absolute encoder (in degrees) is _____.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.35,0.36

1 point

11) A PMDC motor has an armature resistance of 0.4 Ω and a back emf constant of 0.4 V/(rad./s). The motor is supplied from a 24 V DC source. The armature of the motor draws a current of 5 A at a certain load condition. The non driving end of the motor is coupled with an incremental encoder of resolution 1000 PPR. Determine the frequency in Hz of the output pulses from any one channel of the encoder, in this condition. Do the calculations correct to 3 decimal places.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 8700,8800

1 point

12) A stepper motor is constructed with

- projecting poles on the stator and a cylindrical rotor without any poles
 projecting poles on the rotor and a cylindrical stator without any poles
 projecting poles on both the stator and rotor
 no projecting poles on both the stator and rotor

No, the answer is incorrect.
Score: 0

Accepted Answers:
projecting poles on both the stator and rotor

1 point

13) Microstepping in a stepper motor operation results in

- an improvement in the resolution of angular variation
 a reduction in the oscillations in rotor positions
 the need for an additional circuitry
 increased tendency of rotor slipping

No, the answer is incorrect.
Score: 0

Accepted Answers:
an improvement in the resolution of angular variation
a reduction in the oscillations in rotor positions

1 point