

Synchronous motors

Test

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1. What does the term synchronous motors mean?

- a) motors whose magnetic field and rotor rotation speeds are the same in static operation, i.e. they rotate synchronously
- b) motors whose stator and rotor current frequencies are the same in static operation, i.e. they change synchronously
- c) motors whose static operation the phases of the stator and rotor currents are the same, i.e. they change synchronously
- d) motors in which, in static operation, energy conversion by the stator and rotor is carried out synchronously

2. The rotors preferred for synchronous machines which operate at low speed (for example, coupled to hydraulic turbines)

- (a) salient pole type
- (b) cylindrical rotor type
- (c) solid rotor type
- (d) any of above.

3. Stator of a synchronous machine consists of

- (a) an iron core
- (b) stator winding
- (c) both a and b above
- (d) none above

4. What angle is called the «load angle» of synchronous machine?

- a) Angle between vectors of the back-emf and the voltage of the stator
- b) Angle between vectors of the back-emf and the current of the stator
- c) Angle between vectors of the voltage of the stator and the current of the stator

5. What types of the emfs are applied in the stator circuit in synchronous machine with cylindrical rotor?

- a) emf of the rotor field flux
- b) emf of the armature reaction flux
- c) emf of the stator leakage flux
- d) emf of the rotor leakage flux

6. How will the maximum torque of the synchronous machine with cylindrical rotor change if the voltage decrease by half?

- a) will decrease by half
- b) will decrease by a factor of four
- c) will decrease by a factor of 1.41

7. Consider the synchronous machine that has salient pole rotor and there is no field flux of the rotor. How will the maximum torque change if the voltage decrease by half?

- a) will decrease by half
- b) will decrease by a factor of four
- c) will decrease by a factor of 1.41

8. Consider salient pole synchronous motor with 2 poles.

The excitation voltage E_f is 16 V. The stator terminals voltage V_s is 24 V.

$L_d = 0.012$ H, $L_q = 0.009$ H. The motor speed is 120 rpm, load angle is 60 deg.

Find the value of an electromagnetic torque of the motor.

9. Consider salient pole synchronous motor with 2 poles.

The excitation voltage E_f is 18 V. The stator terminals voltage V_s is 24 V.

$L_d = 0.015$ H, $L_q = 0.01$ H. The motor speed is 200 rpm, load angle is 70 deg.

Find the maximum value of the reluctance torque of the motor.

10. Specify the range of load angles corresponding to unstable operation of synchronous machine with cylindrical rotor

a) $|\vartheta| > \pi/2$

b) $|\vartheta| < \pi/2$

c) $|\vartheta| < \pi$

d) $|\vartheta| > \pi$

e) $|\vartheta| > \pi/4$

f) $|\vartheta| < \pi/4$

11. Specify the construction of the PMSM that hasn't reluctance torque

a)



b)



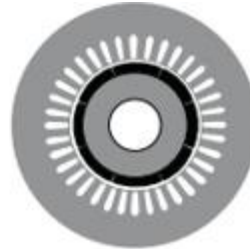
c)



d)



e)



12. Specify the construction of the PMSM where there are both types of torques, and the reluctance torque is much more than electromagnetic torque

a)



b)



c)



d)

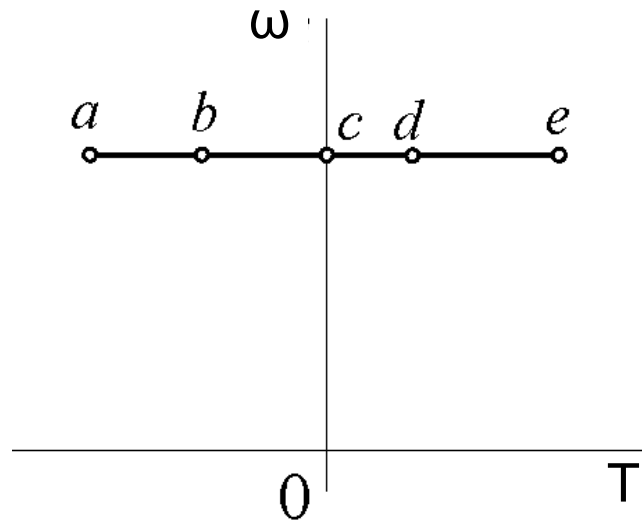


e)



13. Specify the section corresponding to the operation of the synchronous machine in the motor mode

- a) bd
- b) ab
- c) bc
- d) cd
- e) de
- f) ac
- g) ce



14. Specify the necessary condition for the appearance of reluctance torque in the motor

- a) the presence of magnetic asymmetry of the rotor
- b) the presence of magnetic asymmetry of the stator
- c) the presence of asymmetry of the location of the stator windings
- d) the presence of asymmetry of the parameters of the stator windings
- e) both a) and b)

15. Specify the range of load angles corresponding to the unstable operation of the reluctance motor

a) $|\vartheta| > \pi / 2$

b) $|\vartheta| < \pi / 2$

c) $|\vartheta| < \pi$

d) $|\vartheta| > \pi$

e) $|\vartheta| > \pi / 4$

f) $|\vartheta| < \pi / 4$

Thank you!

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