Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(Electrical & Electronics) (2013 Onwards)/
B.Tech.(Electronics & Electrical) (2013 Batch)

(Sem.–4)

ELECTRICAL MACHINERY-II

Subject Code : BTEEE-401
Paper ID : [72385]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Answer briefly :

a. Name any two methods of starting a synchronous motor.

b. Why is the efficiency of a 3-phase induction motor less than that of a 3-phase transformer?

c. Why does a 3-phase induction motor always run at a speed less than the synchronous speed?

d. Find the step-angle for a 3-stack variable reluctance stepping motor with 16 poles on both stator and rotor.

e. What is meant by armature reaction of a synchronous machine?

f. Why is the voltage regulation of an alternator negative for leading power factor loads?

g. What is a synchronous condenser?

h. Why are X_d and X_q value different for salient-pole alternator whereas they are same for smooth rotor machines?

i. Describe the operating condition at which an alternator will give negative voltage regulation.

j. Calculate the pitch factor for the following winding :

36 stator slots, 4 poles, coil span 1 to 8

SECTION-B

2. A 50 Hz, 440V, three phase, 4-pole induction motor develops half the rated torque at 1490 r.p.m. with the applied voltage magnitude remaining at the rated value, what should be its frequency if the motor has to develop the same torque at 1600 r.p.m? Neglect stator resistance, leakage reactance and iron losses.

3. Draw the phasor diagram of a round-rotor alternator on :

   a. open-circuit.

   b. short- circuit.

   Discuss why short-circuit characteristic is a straight line whereas open-circuit characteristic is a curve.

4. For two alternators running in parallel, show with the help of a phasor diagram that the effect of increasing the driving torque of an alternator is to make it take an increased share of load.

5. Describe a 4-phase, 4-pulse brushless dc motor. Discuss how torque is developed in this motor. In case phase currents are assumed to vary sinusoidally, show that output torque is independent of rotor-angular position.

6. In an alternator, a lagging current has the effect of weakening the main field; but in a synchronous motor, the effect of lagging current is to strengthen the main field. Explain.

SECTION-C

7. Describe, with physical concepts, the hunting phenomenon in synchronous machines. Explain why hunting is objectionable. What are the various causes of hunting? How can it be reduced?

8. A 3300 V, star-connected synchronous motor works at constant terminal voltage and constant excitation. Its synchronous impedance is $1 + j\,10\ \Omega$, per phase. It operates at a pf of 0.8 leading when taking 600 kW from the mains. Find the power factor when the input is increased to 900 kW.

9. Sketch the torque-slip characteristics of an induction motor working at rated voltage and frequency. Explain and draw these characteristics with respect to normal one, if the following changes are made:

   a. Applied stator voltage is reduced to half at rated frequency.

   b. Both the applied voltage and frequency are reduced to half.