VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. (E.E.E.) III Year II-Semester Main Examinations, May-2017
Electrical Machinery-III

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Explain how harmonics are suppressed in synchronous machine.

2. List out the advantages of fractional slot windings.

3. What are direct axis reactance (X_d) and quadrature axis reactance (X_q)?

4. What are the conditions to be satisfied for parallel operation of synchronous generators?

5. Explain about hunting in a synchronous motor

6. What is reluctance power?

7. Draw the complete wave form of symmetrical short circuit current in a synchronous machine.

8. Mention any two applications of switched reluctance motor.

9. Explain why a single phase motor is not self starting.

10. Explain what happens if a DC series motor is connected to AC supply.

Part-B (5 × 10 = 50 Marks)

11. a) Derive the EMF equation of an alternator. [5]

   b) A 3-phase, 16 pole star connected synchronous generator has a resultant air gap flux of 0.06 Wb per pole. The flux is distributed sinusoidally over the pole. The stator has three slots per pole per phase and 4 conductors per slot. The coil span is 150° electrical. Calculate the phase and line induced voltages when the machine runs at 375 rpm. [5]

12. a) Discuss the potier triangle method of finding voltage regulation of an alternator. [7]

   b) Explain the synchronization of two alternators by using three dark lamp method. [3]

13. a) Describe the effect of varying excitation upon armature current and power factor of a synchronous motor when input power to the motor is maintained constant. [5]

   b) A 3-phase, 3300 V, 50 Hz star connected synchronous motor takes 40 A current. Its synchronous reactance is 20 Ω per phase. Find the power supplied to the motor and induced e.m.f for 0.8 lagging power factor. Neglect armature resistance. [5]

14. a) A 100 MVA, 11 kV, 3-phase star connected alternator is running at synchronous speed with rated voltage. Its terminals are open circuited. A sudden 3-phase fault develops at its terminals. The per unit reactances are $X_d = 1.0$, $X_d^1 = 0.25$, $X_d^{11} = 0.12$. The time constants are $T_d^1 = 1.1$sec, $T_d^{11} = 0.04$sec. The initial dc component of current is such that the total current is 1.5 times of the initial ac component of current. Find [6]

   i) AC component of current at the instant of short-circuit.
   ii) Total current at the instant of short-circuit.
   iii) AC component of current after 2 cycles.

   b) Discuss construction and principle of operation of permanent magnet stepping motor. [4]

15. a) Explain double field revolving theory and obtain the equivalent circuit of single phase motor. [5]

b) Explain the construction and principle of operation of permanent capacitor single phase induction motor and its applications. [5]

16. a) Explain, why synchronous impedance method of computing the voltage regulation leads to pessimistic values. [3]

b) Explain two reaction theory of salient pole alternator. [7]

17. Answer any *two* of the following:

a) Write short notes on synchronous condenser. [5]

b) Explain briefly construction and principle of operation of switched reluctance motors. [5]

c) Explain construction and principle of operation of shaded pole motor. [5]

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