

**ANNA UNIVERSITY COIMBATORE**  
**B.E. / B. TECH. DEGREE EXAMINATIONS : JUNE 2009**  
**REGULATIONS : 2007**  
**FOURTH SEMESTER – ELECTRICAL & ELECTRONICS ENGG.**  
**070280026 - SYNCHRONOUS AND INDUCTION MACHINES**

**TIME: 3 Hours**

**Max. Marks: 100**

**PART – A**

**(20 x 2 = 40 MARKS)**

**ANSWER ALL QUESTIONS**

1. What are the basic constructional parts of an Alternator?
2. Write the EMF equation of an Alternator.
3. What is known as armature reaction?
4. What are the conditions to be fulfilled for the parallel operation of Alternators?
5. How a Synchronous machine is different from an Induction machine?
6. What is known as Hunting in Synchronous machine?
7. What are the applications of Synchronous motor?
8. What are the advantages of 3 phase Induction motor over synchronous motor?
9. Give any two differences between V & inverted – V curves.
10. Define the term Slip of an Induction motor.
11. What is an Induction generator?
12. What are the parameters obtained through Blocked rotor test?
13. Why high power Induction motors should not be started directly?
14. Name different types starters used in 3 phase Induction motor.
15. What are the possible methods available to control the speed of 3 phase Induction motor?

16. What is the significance of cascaded connection of Induction motors?
17. What is the necessity of knowing double revolving field theory?
18. How a single phase Induction motor is made as self starting motor?
19. What are the different types of Repulsion motor?
20. What are the features of Universal motor?

**PART – B**

**(5 x 12 = 60 MARKS)**

**ANSWER ANY FIVE QUESTIONS**

21. a) Explain the working principle of operation of an Alternator. (6)  
b) A 3 phase, 16 poles Alternator has star connected winding with 144 slots and 10 conductors per slot. The flux per pole is  $0.03 \text{ Wb}$ , sinusoidally distributed and the speed is 375 rpm. Find the frequency, phase emf and line emf. Assume full pitched coil. (6)
22. a) Explain the working principle of a Synchronous motor with neat diagram. (6)  
b) Discuss the effect of excitation on armature current and power factor of a Synchronous motor. (6)
23. a) Explain the construction details of Squirrel - cage rotor of a 3 phase Induction motor with neat diagram. (6)  
b) The power input to the rotor of 400 volts, 50 Hz, 6 poles, 3 phase Induction motor is 75 Kw. The rotor electromotive force is observed to make 100 complete alterations per minute. Calculate (i) Slip, (ii) Rotor speed, (iii) Rotor copper loss per phase, (iv) Mechanical power developed. (6)

24. a) Explain the starting mechanism of 3 phase Squirrel cage Induction motor using Star-Delta starter with neat diagram. (7)
- b) Draw the slip-torque characteristics of a 3 phase Induction motor and discuss its various regions of operations. (5)
25. a) Explain double revolving field theory of a single phase Induction motor. (8)
- b) Write a brief note on Hysteresis motor. (4)
26. a) How to determine  $X_d$  and  $X_q$  of a Synchronous machine from slip test? Explain with neat diagram. (8)
- b) Discuss briefly about Synchronous condenser. (4)
27. a) Derive the equivalent circuit model of a 3 phase Induction motor. (8)
- b) Discuss in detail the speed control methods 3 phase slip ring Induction motor supply frequency. (4)
28. a) Draw and explain the construction of single phase Induction motor with neat sketch. (6)
- b) Explain the working principle of a Stepper motor. (6)

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