

MADV  
25/5/07  
20

- N.B. :** (1) Question No. 1 is compulsory.  
 (2) Attempt any four out of remaining.  
 (3) Assume additional data if necessary and justify the same.

T. F. (Handwritten) VI Rev Effect m/c-II

1. Write short notes on :
  - (a) Cogging and crawling in induction motor
  - (b) Hunting in synchronous motor
  - (c) Slip test to determine  $X_d$  and  $X_q$ .
  
2. (a) The 110 V, 150 W, 50 Hz, 6 pole IM gave following data 10  
 NL Test 110 V 63 W 2.7 A  
 BR Test 55 V 212 W 5.8 A  
 Stator winding resistance  $2.5 \Omega$  and starting winding is open during BR test. Determine eq. circuit parameters and core, friction and windage losses.
- (b) Explain split phase 1 $\phi$  IM. How to improve starting torque of split phase IM. Compare their torque speed characteristics. 10
  
3. (a) Derive an expression for mechanical power developed in case of salient pole synchronous machine. 10
- (b) A 3300 V star connected synchronous motor has synchronous impedance  $0.4 + j5 \Omega$  per phase for an excitation emf of 4000 V and motor input power of 1000 kW at rated voltage, compute line current and power factor. 10
  
4. (a) Explain how synchronous motor is used to improve power factor with phasor diagram in details hence explain V and inverted V curves. 10
- (b) A 3 phase induction motor has 150% starting torque and 250% max. torque of its full load torque. Neglect stator resistance and assume const rotor resist. Compute slip at max. torque, full load slip, rotor current at starting in terms of full load current. 10
  
5. (a) A 20 MVA, 3 phase star connected 11 kV, 12 pole, 50 Hz salient pole synchronous motor with negligible armature resistance has reactances of  $X_d = 5 \Omega$  (five) and  $X_q = 3 \Omega$ . At full load, upf and rated voltage compute excitation voltage, power, synchronising power per electrical degree and corresponding torque. 10
- (b) Explain auto transformer starting and star delta starting for three phase induction motor and compare their torques with DOL starting. 10
  
6. (a) Explain with the help of neat diagram, torque-speed characteristics of a phase induction motor. What is effect of adding resistance to rotor circuit. 10
- (b) A 15 kW, 400 V, 4 pole 50 Hz three phase star connected Induction motor gave following test results. 10

	Line Vtg	Line Current	power i/p
NL test	400 V	9 A	1310 W
BR test	200 V	50 A	7100 W

Assume stator and rotor ohmic losses equal at standstill. Draw circle diagram and find line current, power factor, slip torque and efficiency at full load.

7. (a) A 6.6 kV 3 phase 50 Hz star connected alternator gave following test data : 15

	3.2	5.0	7.5	10.0	14.00
$I_f$ in A					
$E_f$ in kV	3.1	4.9	6.6	7.5	8.24
$I_{sc}$ in A	500	778	1170	-	-
$Z_{pf}$ terminal voltage in KC	-	1.85	4.24	5.78	7.0

Per phase armature resist is  $0.2 \Omega$ . Calculate voltage regulation at full load current of 500 A at 0.8 pf lag by  $Z_{PF}$  and ASA method.
- (b) Derive expression for distribution factor. 5