

5. (a) State various types of stepper motor. Explain variable reluctance stepper motor in detail. 10
 (b) Explain Blondel's two reaction theory of salient pole synchronous machines. 10
6. (a) A 6.6 kV, 3 phase, 50Hz star connected alternator gave following data for Open Circuit, Short Circuit and Full Load ZPF tests. 15

I_f (A)	3.2	5.0	7.5	10	14
E_f (kV)	3.1	4.9	6.6	7.5	8.24
I_{sc} (A)	500	778	1170	-	-
ZPF terminal voltage (kV)	-	1.85	4.24	5.78	7

Per phase armature resistance is 0.2Ω

Calculate voltage regulation at full load current of 500 amp at 0.8 p.f. lag by ZPF & ASA method.

- (b) Explain conditions for parallel operation of synchronous generators 05
7. (a) Explain excitation circle & power circle of synchronous motor with neat diagram 10
 (b) Write a short note on starting of synchronous motor against high torque 10