

B.E.(with Credits)-Regular-Semester 2012 - Electronics Engineering Sem IV
EN 405 - Basic Electrical Machines

P. Pages : 2

Time : Three Hours



GUG/W/16/3908

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
 2. Due credit will be given to neatness and adequate dimensions.
 3. Assume suitable data wherever necessary.
 4. Illustrate your answers wherever necessary with the help of neat sketches.
 5. Non programmable calculator are permitted.

1. a) Draw the equivalent circuit of a single phase transformer and hence approximate equivalent circuit refer to the primary side also draw the vector diagram when the transformer is loaded with inductive load. 8
- b) Obtain the equivalent circuit of a 200/400V, 50Hz, 1 ϕ transformer from the following test data 8
O.C. test 200V, 0.7A, 70W – on L.V. side
S.C. test 15V, 10A, 85W – on H.V. side
Calculate the secondary voltage when delivering 0.8 p.f. lagging when the primary voltage is 200V.

OR

2. a) Following results were obtained on a 50KVA, 2400/120V transformer. 8
O.C. test: 396W, 9.65A, 120V – on L.V. side
S.C. test: 810W, 20.8A, 92V – on H.V. side
Determine:
i) the circuit constants
ii) the efficiency at full load, 0.8 p.f. lagging
iii) the approximate voltage regulation
- b) Explain open circuit test and short circuit test to determine equivalent circuit parameters of transformers. 8
3. a) Explain the different types of generators according to excitation of field winding. 8
- b) A four pole lap wound dc shunt generator has a Useful flux per pole of 0.07wb the armature winding consist of 220 turns each of 0.004Ω resistance. Calculate the terminal voltage when running at 900 r.p.m. if the armature current is 50AMP. 8

OR

4. a) A dc generator has an emf of 100V when the Useful flux per pole is 20 mWb and the speed is 800 RPM. Calculate the generated emf 8
i) With the same flux and the speed of 1000 RPM.
ii) With a flux per pole of 24 mWb and a speed of 900 RPM.
- b) Explain the concept of Armature reaction in dc generator and its effect. 8

5. a) Prove that torque developed 8
 i) In dc shunt motor directly proportional to armature current.
 ii) In dc series motor directly proportional to armature current.
- b) Explain the methods of speed control of dc shunt motor 8
 i) flux control method
 ii) armature voltage control method

OR

6. a) A 250 V shunt motor has a armature current of 20 Amp when running at 1000 rpm against full load torque the armature resistance is 0.5Ω . What resistance must inserted in series with the armature to reduced to speed 500 rpm as the same torque and what will be the speed if the load torque halved with this resistance in the circuit assume the constant flux throughout and neglect brush drop. 8
- b) Explain the methods of speed control of dc series motor with suitable connection diagram. 8
7. a) Explain the torque speed characteristics of 3 ϕ Induction motor and the effect of varying total resistance on starting and maximum torque. 8
- b) A 3 ϕ Induction motor has a 4 pole star connected stator winding the motor runs at 50Hz supply with 200V between slipring the rotor resistance and standstil rotor reactance per phase are 0.1Ω and 0.9Ω respectively the ratio of rotor to stator turns is 0.67. Calculate 8
 i) Total torque at 4% slip
 ii) Maximum torque
 iii) Speed at maximum torque
 iv) Maximum mechanical power

OR

8. a) A 4 pole 50Hz, 7.46kw, 3 ϕ Induction motor at rated Voltage and frequency has a starting torque of 160% and maximum torque of 200% of full load torque determine full load speed and speed at maximum torque. 8
- b) Explain the construction and working of Universal motor and write down the application of Universal motor. 8
9. a) Define the terms synchronous impedance and voltage regulation of an alternator explain the synchronous impedance method to determine regulation of alternator. 8
- b) Draw and explain to phasor diagram of a loaded alternator for 8
 i) lagging p.f.
 ii) leading p.f.
 iii) Unity p.f.

OR

10. a) What are V – curve and inverted V curve of a synchronous motor? What are the main characteristics of the synchronous motor? 8
- b) Explain the operation of a synchronous motor under 8
 i) Constant load with excitation decrease.
 ii) Constant load with excitation increase. Draw the phasor diagram.
