

**SUBJECT CODE NO:- P-308**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**S.E. (EEP/EE/EEE) Examination MAY/JUNE-2016**  
**AC Machines**  
**(Revised)**

[Time: Three Hours]

[Max Marks:80]

“Please check whether you have got the right question paper.”

- N.B
- i) Q.No.1 and Q.No.6 are compulsory.
  - ii) Solve any two questions from Q. No 2 to Q.No.5.
  - iii) Solve any two questions from Q. No 7 to Q.No.10.
  - iv) Assume suitable data, if required.

**Section A**

- Q.1 Attempt any five 10
- a) What is the fractional slip of an induction motor with relation to rotor Cu loss and rotor input?
  - b) Define slip and write its expression.
  - c) Comment on the power factor of a squirrel cage induction motor.
  - d) Why are induction motors called asynchronous?
  - e) How would you reverse the direction of rotation of a capacitor start induction run motor?
  - f) What could be the reasons if a repulsion induction motor fails to start?
  - g) Write some features of a hysteresis motor.
  - h) Draw torque slip characteristics of a 3- phase induction motor.
- Q.2 05
- a) Describe the principle of induction motor 05
  - b) Derive the expression for starting torque of 3- phase induction motor. 05
  - c) A 50HZ 8 pole induction motor has F.L slip of 4%. The rotor resistance/ phase = 0.01 ohm and standstill reactance/ phase=0.1 ohm. Find the ratio of maximum to full load torque and the speed at which the maximum torque occurs. 05
- Q.3 05
- a) Why starter is required to start a 3 phase induction motor. 05
  - b) A cascade set consists of two motors A and B with 4 poles and 6 poles respectively. The motor is connected to a 50HZ Supply. 05  
 Find i) The speed of the set  
 ii) The electric power transferred to motor B when the input to motor A is 25KW neglect losses.
  - c) Describe any one speed control method of 3 phase induction motor. 05
- Q.4 05
- a) Explain the types of capacitor start motors. 05
  - b) Explain the working of a single phase induction motor. 05
  - c) Draw equivalent circuit of single phase induction motor describing all the parameters. 05
- Q.5 05
- a) Draw the schematic diagram of capacitor start, capacitor run single phase induction motor and torque speed characteristics 05
  - b) Derive the expression for maximum power output of 3 phase induction motor. 05
  - c) A 3 phase 115 volt induction motor has the following constants, 05  
 $R_2 = 0.07\Omega$ ,  $R'_2 = 0.08\Omega$ ,  $X_1 = 0.4\Omega$ ,  $X'_2 = 0.2\Omega$  All the values are for one phase only. At which slip the gross power output will be maximum and the value of the gross power output?

## Section B

- Q.6 Attempt any five 10
- a) What are the essential elements for generating emf in synchronous generator?
  - b) What is a exciter?
  - c) What are the losses that take place in a synchronous generator?
  - d) Why are the poles and pole shoes laminated?
  - e) Mention some specific applications of synchronous motor.
  - f) Will the motor start with the field excited. Justify.
  - g) Comment on the V curves of a synchronous motor.
  - h) Draw the equivalent circuit of a synchronous motor.
- Q.7
- a) Derive the expression for power developed by a synchronous motor. 05
  - b) A 400V, 10hp (7.46Kw), 3 phase synchronous motor has negligible armature resistance and a synchronous reactance of 10w/phase. Determine the minimum current and the corresponding induced emf for full load conditions. Assume 85% efficiency 05
  - c) Explain hunting in synchronous 05
- Q.8
- a) Write the applications of synchronous motor 05
  - b) A synchronous motor absorbing 60kw is connected in parallel with a factory load of 240kw having a lagging p.f of 0.8. If the combined load has a p.f of 0.9 what is the value of the leading KVAR supplied by the motor and what p.f it is working. 05
  - c) Explain the working principle of synchronous motor. 05
- Q.9
- a) Derive the expression of induced emf of synchronous generator. 05
  - b) Describe the synchronous impedance method. 05
  - c) Find the power angle when a 1500KVA 6.6KV, 3 phase, Y- connected alternator having a resistance of 0.4  $\Omega$  and a reactance of 6 ohm per phase delivers full load current at normal rated voltage and 0.8 p.f lag. 05
- Q.10
- a) Explain the zero power factor method. 05
  - b) Describe synchronous condenser. 05
  - c) Write a short note on damper winding. 05