VI Semester B.E. (E&E) Degree Examination, December 2017/January 2018
(2K11 Scheme)
EE 603 : ELECTRIC DRIVES

Time : 3 Hours   Max. Marks : 100

Instruction : Answer **five full** questions choosing atleast **two** from **each** Part.

PART – A

1. a) What is an electric drive ? What are its advantages over other types of drive systems ?   **6**

   b) With the help of a block diagram, explain the basic elements of an electric drive system.   **6**

   c) Obtain the condition for stability in an electric drive system.   **8**

2. a) Explain the different operating modes of a separately excited DC motor with diagrams.   **6**

   b) A separately excited DC motor speed is controlled by the circuit shown below. The field current is set at its maximum value. The resistance $R_a = 0.25 \, \Omega$ and $R_f = 175 \, \Omega$. Motor voltage constant $K_v = 1.4$ V/A – rad/sec. The armature current corresponding to load demand is $I_a = 45$ A. The viscous friction and no load losses are negligible. The inductances of armature and field are sufficient to make the armature and field current continuous and ripple free. If the delay angle of armature $\alpha_a = 60°$ determine :
      a) The torque developed by the motor T_d
      b) The speed W
   c) The input power factor of the drive.   **8**
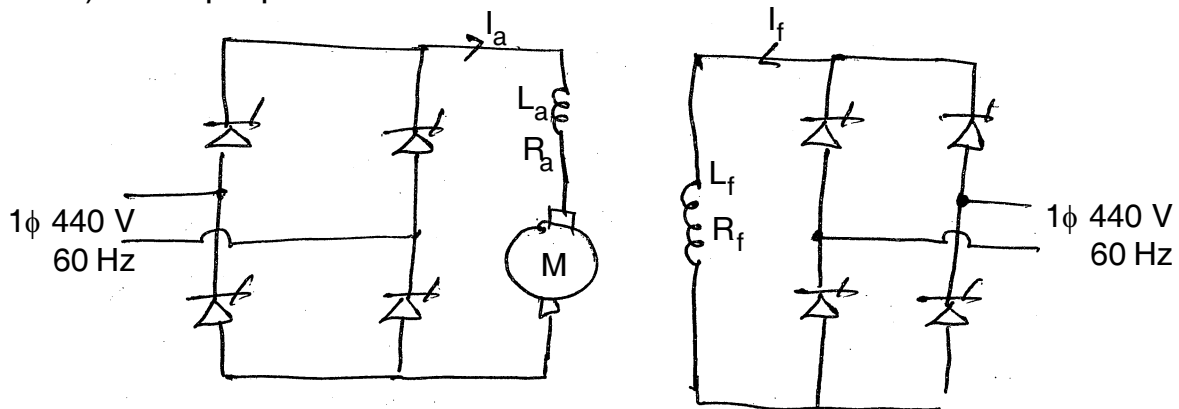
   c) Explain the different possible control modes of a dc chopper drive.   **6**

3. a) With sketch explain the operation and applications of a multiphase chopper. **8**

   b) From basics derive the equations for

      a) Response due to step change in reference voltage

      b) Response due to a change in load torque

      for a converter fed separately excited DC motor drive. Hence represent the equations obtained in the block diagram form. **12**

4. a) With the help of circuit model of an induction motor, derive the equation for the torque developed T_d in terms of supply voltage and slip. **10**

   b) A three phase 460 V, 60 Hz, 4 pole star connected induction motor has the following equivalent circuit parameters $R_s = 0.42\,\Omega$, $R_r = 0.23\,\Omega$, $X_s = X_r = 0.82\,\Omega$, $X_m = 22\,\Omega$. The no load loss is 60 watts is constant. The rotor speed is 1750 rpm. Using the approximate equivalent circuit shown below, determine :

      i) the synchronous speed W_s

      ii) the slips

      iii) input current

      iv) input power

      v) input power factor of the supply

      vi) the gerp power

      vii) the rotor copper loss

      viii) the stator copper loss

      ix) the developed torque T_d

      x) the efficiency. **10**
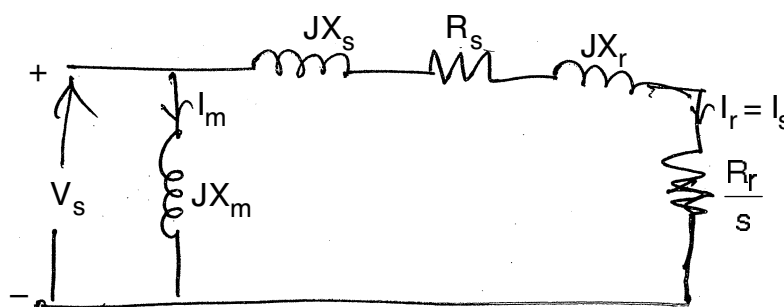
PART – B

5. a) Explain the construction and working principle of the BLDC motor. **8**

   b) Explain with the help of cross sectional view, the operation of switched reluctance motor. **6**

   c) Explain the operation of the switched reluctance motor drive circuit. **6**

6. a) What are stepper motors ? What are its applications ? Explain the construction and operation of a stepper motor. **10**

   b) What are the different classes of a motor duty ? Explain them in brief. **10**

7. a) Explain how heating and cooling takes place in a motor. Also give the classification of classes of insulating materials with temperature ranges. **12**

   b) Explain the drive requirements for a textile mill. **8**

8. a) What are the methods of cement manufacturing process ? Explain them in brief with the electrical drive requirements. **10**

   b) Explain the different types of steel rolling mills with electrical drive requirements. **10**

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