
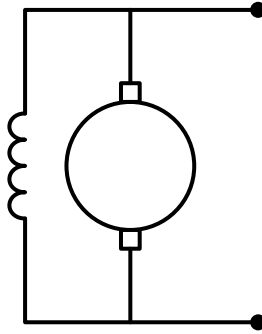
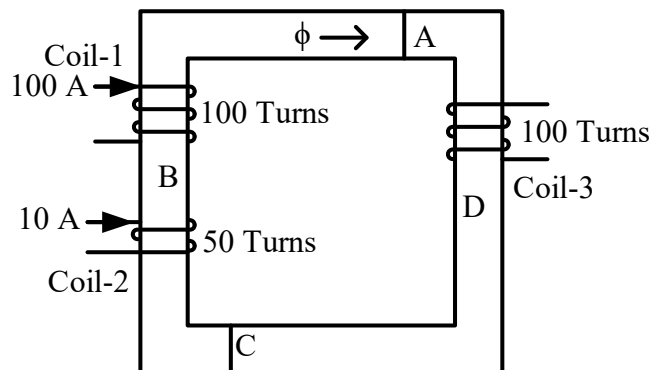


- ★ 1. A 300V, 15A, 1000rpm DC shunt motor is having an armature resistance of  $0.1 \Omega$  and field winding resistance of  $200 \Omega$  (Applied voltage to the motor is 300V and it draws 15A from the source and runs at 1000rpm while driving the full load). Determine:
- Armature current on full load. (0.5)
  - Armature current at 50% of full load. (0.5)
  - Current drawn from the source while driving 50% of full load. (0.5)
  - Back EMF on full load.  (0.5)
  - Back EMF and speed while driving 50% of full load (1)



2. The rotor speed of 3-phase, 50 Hz induction motor while driving a full load is 291 rpm. Determine:
- Number of poles and synchronous speed. (0.5+0.5)
  - Speed of the rotor field with respect to rotor. (0.5)
  - Speed of the rotor field with respect to stator. (0.5)
  - ★ d. Frequency of rotor current at starting (speed of rotor=0) (0.5)
  - e. Frequency of rotor current when  $N_r = 291$  rpm. (0.5)

3. Magnetic Circuit has 2 portions ABC and ADC of identical dimensions (no air gap).  $\mu_r$  of portion ABC is 3 times that of the portion ADC. The reluctance of ADC is 750. Coil-1 and coil-2 are carrying a current of 10 A in the direction shown. If the flux  $\phi = 1 \text{ wb}$  is to be produced in the direction shown. Determine:



- The magnitude and direction of the current in coil-3. (2)
  - What should be the magnitude and direction of current in coil-3 for producing the same flux in the opposite direction to that shown in figure. (1)
4. Assume that the following passive components and power supplies are available to you.
- 3 Phase variable voltage variable frequency supply.
  - 3 Phase R-L bank. (R- Resistor; L-Inductor)
  - Variable voltage DC source.
  - Variable resistor.

You have been told that 3 phase induction motor draws 6-7 times the rated current during starting if rated voltage and rated frequency is applied to the stator.

- a. Suggest an elegant method to reduce this current using one of the above mentioned component/supply. **(0.5)**
- b. Justify your answer. (Be Precise.) **(0.5)**