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Ist Mid Term Exam-2018 **Session: 2018-19**

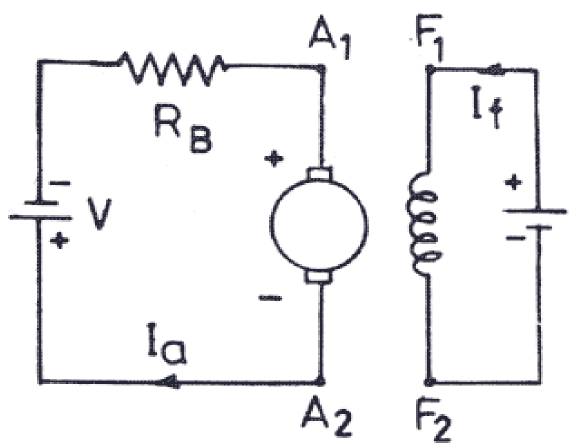
B.TECH 8 Sem **Subject- ELECTRIC DRIVES & THEIR CONTROL** **M.M: 20**

Note: - Attempt all questions & carry equal marks.

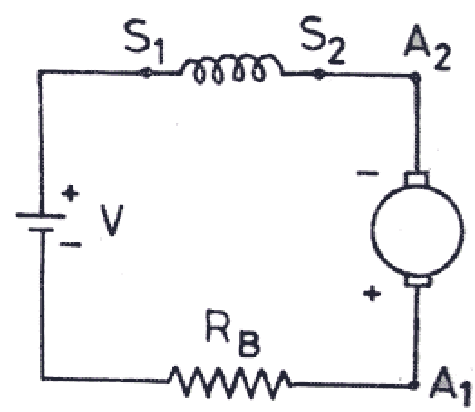
Q.1.:- Explain different types of breaking method applicable for synchronous method . **10**

Ans- Plugging Type Braking -

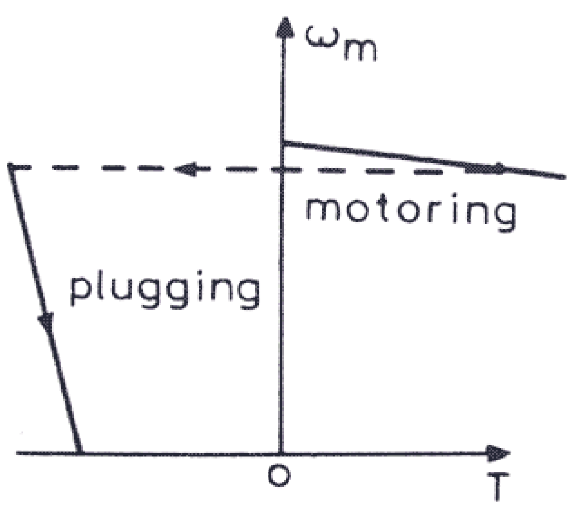
Another type of braking is **Plugging type braking**. In this method the terminals of supply are reversed, as a result the generator torque also reverses which resists the normal rotation of the motor and as a result the speed decreases. During plugging external resistance is also introduced into the circuit to limit the flowing current. The main disadvantage of this method is that here power is wasted.



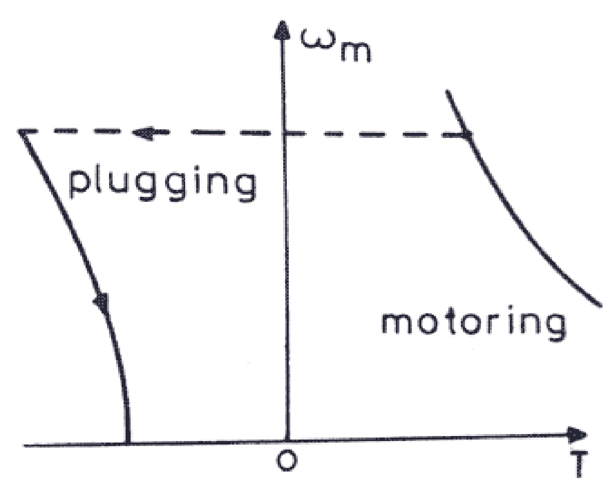
Separately excited



Series



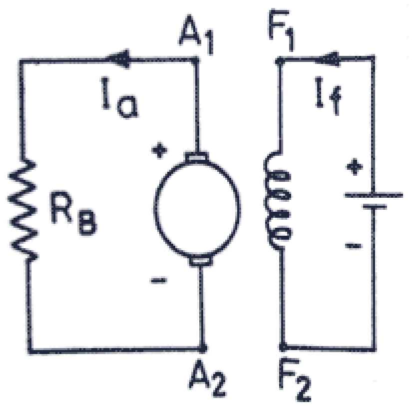
Separately excited



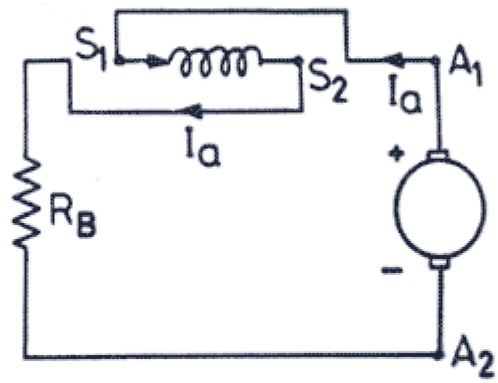
Series

Dynamic Braking

Another method of reversing the direction of torque and braking the motor is **dynamic braking**. In this method of braking the motor which is at a running condition is disconnected from the source and connected across a resistance. When the motor is disconnected from the source, the rotor keeps rotating due to inertia and it works as a self-excited generator. When the motor works as a generator the flow of the current and torque reverses. During braking to maintain the steady torque sectional resistances are cut out one by one.



Separately excited motor



Series motor

OR

Q.1.:- Describe the dual converter control of D.C. motor. **10**

Ans-

SPEED CONTROL OF DC MOTOR USING DUAL CONVERTER ABSTRACT The speed control of DC motor is very crucial in applications where precision is required. Dual converters are used for four-quadrant operation of DC drive. The best control characteristics of DC motor have used in industries for different range of loading condition. This project presents the speed control scheme of DC motor and provides a firing angle based speed control technique of the separately exited dc motor. Speed of DC motor is controlled by controlling the armature voltage. Armature voltage is controlled using controlling the firing angle of thyristor. The circulating operation of dual converter, in which rectifier 1 will be rectifying ($0<\alpha_1<\alpha_2$

Average output voltage of Single-phase converter = $2V_m \cos\alpha / \pi$

Average output voltage of Three-phase converter = $3V_m \cos\alpha / \pi$

For converter 1, the average output voltage, $V_{01} = V_{max} \cos\alpha_1$

For converter 2, the average output voltage, $V_{02} = V_{max} \cos\alpha_2$

The Output voltage is given by,

$$V_0 = V_{01} = -V_{02}$$
$$V_{max} Cos\alpha_1 = -V_{max} Cos\alpha_2$$
$$Cos\alpha_1 = Cos(180^o - \alpha_2) \; or \; Cos\alpha_2 = Cos(180^o + \alpha_2)$$
$$\alpha_1 + \alpha_2 = 180^o \; And \; \alpha_1 - \alpha_2 = 180^o$$

The firing angle can never be greater than 180. So, $\alpha 1 + \alpha 2 = 180^0$

Q.2.:- Explain the transient analysis of separately excited motor with armature and field control**.** **10**

Ans –

Numerical analysis involves the study of methods of computing numerical data. In many problems this implies producing a sequence of approximations by repeating the procedure again and again [2]. People who employ numerical methods for solving problems have to worry about the following issues: the rate of convergence (how long does it take for the method to end the answer), the accuracy (or even validity) of the answer and the completeness of the response (do other solutions, in addition to the one found, exist). Numerical methods provide approximations to the problems in question. No matter how accurate, they are, they do not, in most cases, provide the exact answer. In some instances working out the exact answer by a different approach may not be possible or may be too time consuming and it is in these cases where numerical methods are most often used Euler's method: Euler's method provides us with approximation for the solution of the differential equations. The idea behind Euler's method is to use the concept of linearity to join multiple small line segments so that they make up an approximation of the actual curve. Note: Generally, the approximation gets less accurate the further you get away from the initial point Three things needed in order to use Euler's method: 1) Initial point –Starting point must be given. 2) Delta- The change in step size must be given directly or information to find it

1. Eulers method
2. GNU

OR

Q.2.:- Describe switched reluction motor's important features and applications. **10**

Ans- The **switched reluctance motor** (SRM) is a type of stepper motor, an electric motor that runs by reluctance torque. Unlike common DC motor types, power is delivered to windings in the stator (case) rather than the rotor. This greatly simplifies mechanical design as power does not have to be delivered to a moving part, but it complicates the electrical design as some sort of switching system needs to be used to deliver power to the different windings. With modern electronic devices, precisely timed switching is not a problem, and the SRM is a popular design for modern stepper motors. Its main drawback is torque ripple. However, controller technology that limits torque ripple at low speeds has been demonstrated.

An alternate use of the same mechanical design is as a generator when driven mechanically, and the load is switched to the coils in sequence to synchronize the current flow with the rotation. Such generators can be run at much higher speeds than conventional types as the armature can be made as one piece of magnet sable material, a simple slotted cylinder. In this case use of the abbreviation SRM is extended to mean Switched

Reluctance Machine, although SRG, Switched Reluctance Generator is also used. A topology that is both motor and generator is useful for starting the prime mover, as it saves a dedicated starter motor.

Operating principle

The SRM has wound field coils as in a **DC motor** for the stator windings. The rotor however has no magnets or coils attached. It is a solid salient-pole rotor (having projecting magnetic poles) made of soft magnetic material (often laminated-steel). When power is applied to the stator windings, the **rotor's magnetic reluctance** creates a force that attempts to align the rotor pole with the nearest stator pole. In order to maintain rotation, an electronic control system switches on the windings of successive stator poles in sequence so that the magnetic field of the stator "leads" the rotor pole, pulling it forward. Rather than using a troublesome high-maintenance mechanical commutated to switch the winding current as in traditional motors, the switched-reluctance motor uses an electronic position sensor to determine the angle of the rotor shaft and solid state electronics to switch the stator windings, which also offers the opportunity for dynamic control of pulse timing and shaping. This differs from the apparently similar induction motor which also has windings that are energized in a rotating phased sequence, in that the magnetization of the rotor is static (a salient pole that is made 'North' remains so as the motor rotates) while an induction motor has slip, and rotates at slightly less than synchronous speed. This absence of slip makes it possible to know the rotor position exactly, and the motor can be stepped arbitrarily slowly.

Simple switching -

If the poles A0 and A1 are energized then the rotor will align itself with these poles. Once this has occurred it is possible for the stator poles to be de-energized before the stator poles of B0 and B1 are energized. The rotor is now positioned at the stator poles b. This sequence continues through c before arriving back at the start. This sequence can also be reversed to achieve motion in the opposite direction. This sequence can be found to be unstable. [while in operation, under high load, or high acceleration or deceleration, a step can be missed, and the rotor jumps to wrong angle, perhaps going back one instead of forward three.