



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore - 641 107

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

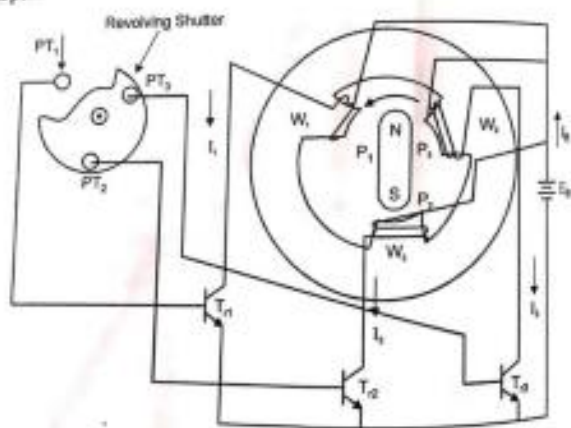
COURSE NAME : 19EE504 SPECIAL ELECTRICAL MACHINES

III YEAR / Vth SEMESTER EEE

Unit 1 - PMBLDC

By

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Optical Sensors

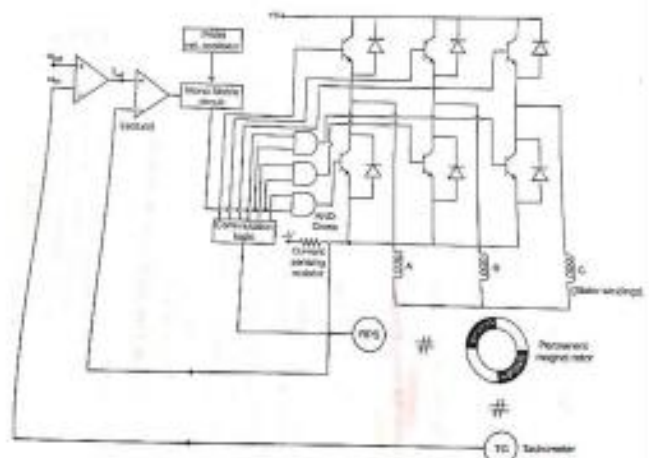
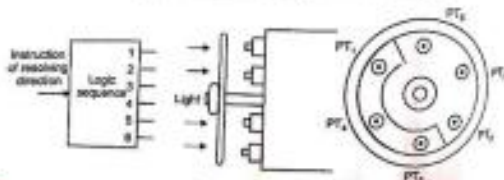
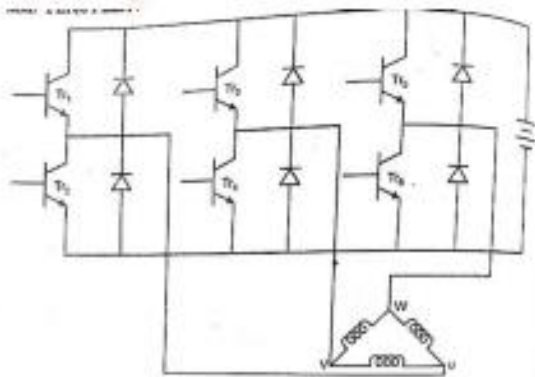
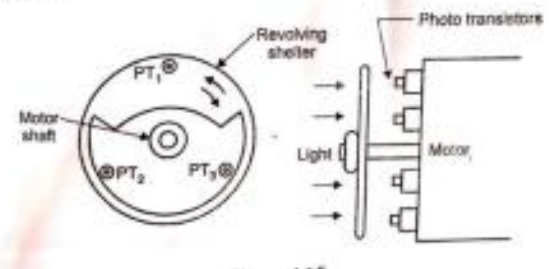


Fig. 4.44. Structure of controller for brushless PM DC motor.

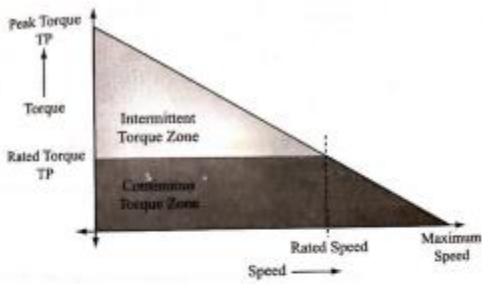


FIGURE 4.18 Torque / Speed characteristics.

1. The continuous current should not exceed the permissible current limit I_n (i.e.) Torque should not exceed $K_T I_n$.
2. The maximum permissible supply voltage = V_n .
3. The speed should not exceed ω_{max} .

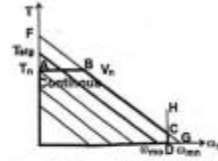
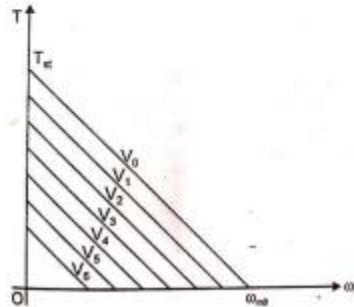
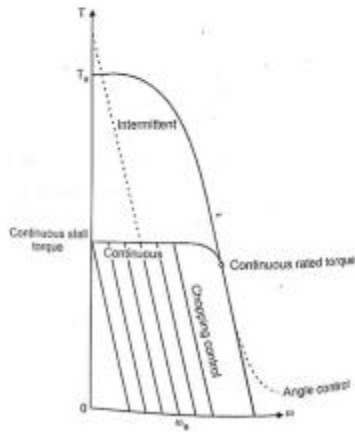


Fig. 5.21: Torque-speed characteristics

4.14 Torque-Speed Characteristics

Figure 4.42 shows torque-speed characteristics.



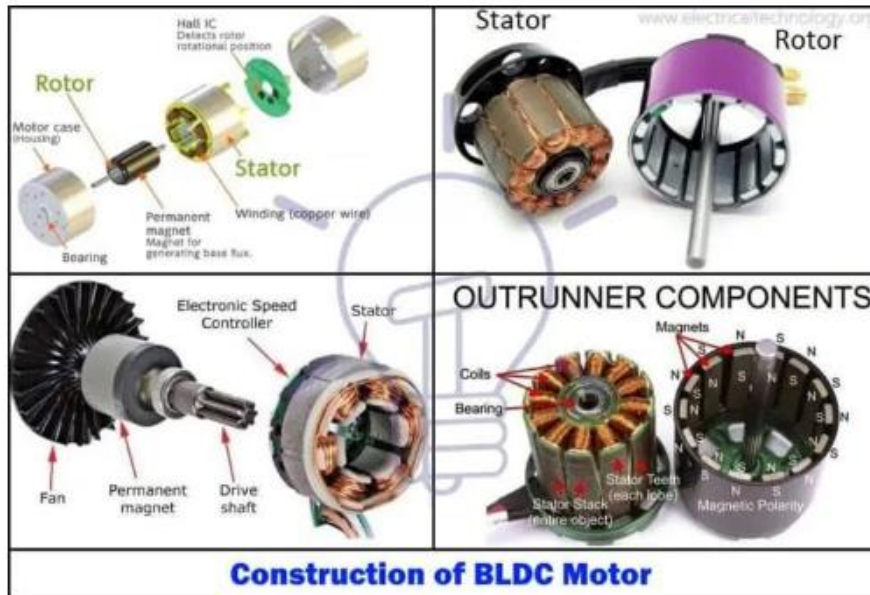
$$I_n = \frac{K_n V}{2 R_{ph}}$$

$$\omega_{no} = \frac{V}{K_n}$$

Figure 4.42

Construction of BLDC Motor

BLDC motors can be constructed in different physical configurations. Depending on the stator windings, these can be configured as single-phase, two-phase, or three-phase motors. However, three-phase BLDC motors with permanent magnet rotor are most commonly used.

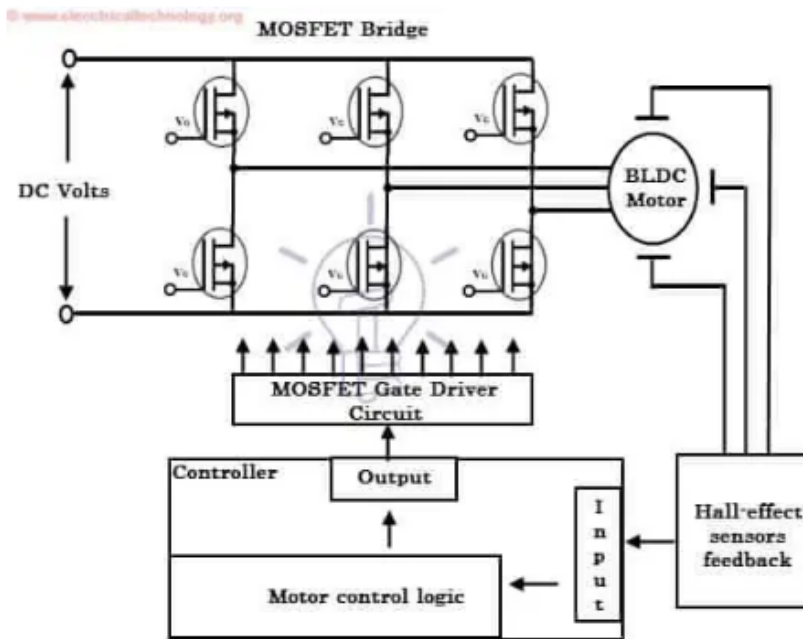


Construction of BLDC Motor

Brushless DC Motor Drive

As described above that the electronic controller circuit energizes appropriate motor winding by turning transistor or other solid state switches to rotate the motor continuously. The figure below shows the **simple BLDC motor drive circuit** which consists of MOSFET bridge (also called as inverter bridge), electronic controller, hall effect sensor and BLDC motor.

Here, Hall-effect sensors are used for position and speed feedback. The electronic controller can be a microcontroller unit or microprocessor or DSP processor or FPGA unit or any other controller. This controller receives these signals, processes them and sends the control signals to the MOSFET driver circuit.



Applications of Brushless DC Motors (BLDC)

Brushless DC Motors (BLDC) are used for a wide variety of application requirements such as varying loads, constant loads and positioning applications in the fields of industrial control, automotive, aviation, automation systems, health care equipments, etc. Some specific applications of BLDC motors are

- Computer hard drives and DVD/CD players
- Electric vehicles, hybrid vehicles, and electric bicycles
- Industrial robots, CNC machine tools, and simple belt driven systems
- Washing machines, compressors and dryers
- Fans, pumps and blowers