INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

With the advancement of science and technology, the demand for rotating electrical machines with a compact drive system has been on the rise. Recently, SRMs have become a major contribution in areas where high starting torque and high rotational speed are required at a low cost. However, a higher rotational speed often shortens the life of mechanical bearings and limits the high speed ability of such motors. Such a situation demands an electrical motor, which can avoid contact between the bearings and shaft to reduce the wear and tear of the mechanical bearings. One such effort by researchers has been made by introducing magnetic bearing in electrical machines and another is the integration of bearingless technology with machines. In this thesis, a specialized stator winding called Bridge Configured Winding (BCW) has been proposed for Switched Reluctance Motor (SRM) which can be used to generate both torque and controllable levitation/radial force using a single set winding and thus provide a cost-saving solution. The winding scheme forms two sets of terminals in each phase, one for torque supply and one for levitation supply. It provides the flexibility to operate as a normal motor when the bridge terminals are not connected. A mathematical model of the proposed motor has been developed and verified using Finite Element Model (FEM). A step by step design methodology has been presented for incorporation of the proposed design in a hardware prototype. The thesis also presents a simulation model of a speed-current controlled drive system for the proposed motor. A real-time closed loop control of radial displacement using PID has been implemented and the capability of the BCW for both torque and radial displacement control has been experimentally validated.

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