GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRICAL (09) /POWER ELECTRONICS (24)
DC MACHINE AND TRANSFORMER
SUBJECT CODE: 2130904
B.E. 3rd Semester

Type of Course: Engineering Science (ELECTRICAL)

Prerequisite: N.A.

Rationale: N.A.

Teaching and Examination Scheme:

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<th>Teaching Scheme</th>
<th>Credits</th>
<th>Examination Marks</th>
<th>Total Marks</th>
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L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE End Semester Examination; PA- Progressive Assessment.

Content:

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<td>40</td>
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| | 24 | 40 |

Note: 30%-40% weightage should be given to the Examples and Short/Multiple choice questions.

Reference Books:

2. Ghosh, Electrical Machine, Pearson Education
3. P.S. Bhimbra, Electrical Machinery, Khanna Publishers
4. Clayton & Hancock, Performance & Design of DC machines, ELBS
6. Irving L. and Kosow, Electric Machinery and Transformers, Prentice-Hall of India
7. George Mepherion, ”An Introduction to Electrical Machines and Transformers”, John Wiley & Sons, NY
10. K. Murukesh Kumar, DC machines and Transformers, Vikas Publishing house Pvt Ltd.

Course Outcomes:

After learning the course the students should be able to:
- Understand working principle, performance, control and applications of DC Machines and Transformer.
- Carry out test and conduct performance experiments on DC machine and Transformer.
- Identify, formulate and solve DC machine and Transformer related problems.
List of Practical including Open Ended Problems:

1. To obtain Magnetizing Characteristics, Internal & External Characteristic of Self Excited DC Shunt Generator. Also obtain the critical filed resistance of the machine from magnetizing Characteristics.
2. To conduct direct load test on a D.C. compound generator with a) Shunt field alone b) Cumulative and differential compounding for short and long shunt connections.
3. To obtain Speed-Torque characteristics of DC Series Motor and DC Shunt Motor.
4. To determine the efficiency of two similar shunt machines by regenerative method. (Hopkinson’s Test.)
5. To perform filed test on D.C. series motor.
6. To determine the various losses in a D.C. machine and separation of its core losses.
7. To perform direct load test on a D.C. shunt motor and plot variation of (a) Input current (b) Speed(c) Torque (d) Efficiency versus output power.
8. To separate hysteresis and eddy current losses of a single phase transformer at rated voltage, frequency by conducting no load tests at different frequencies keeping V/f constant.
9. To operate two single phase transformers of different KVA ratings in parallel and plot the variation of currents shared by each transformer versus load current.
10. To conduct Sumpner test on two identical single phase transformers and determine their efficiency at various loads.
11. To make Scott connection of two single phase transformer and to verify the current relation by drawing phasor diagrams for (a) Balanced and (b) Unbalanced resistive loads.
12. To conduct open circuit and short circuit test on a three phase three winding transformer and determine the equivalent circuit parameters.
13. To conduct Sumpner test on two identical single phase transformers and determine their efficiency at various loads.
14. Speed control of DC Shunt Motor using a) Armature control and b) field control methods. Also perform Swinburne's test on DC Shunt Motor.

Major Equipments:
The necessary no. of Kits, breadboard, equipment, accessories and instruments etc… to be provided to conduct the above practical in a group of max. 4 students.

List of Open Source Software/learning website:
Open Source Software:
- LTSpice for circuit simulation,
- KiCAD for CAD application

Web-based tools for design:
- http://www.fairchildsemi.com/support/design-tools/power-supply-webdesigner/

Circuit Lab:
- https://www.circuitlab.com/editor/

Open source Math Tools:
- http://maxima.sourceforge.net/
- http://www.sagemath.org/
- http://www.scilab.org/
- http://www.gnu.org/software/octave/
Active learning Assignments (AL) : Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.