Mini projects for EE 2001

These mini-projects are assigned to all the students at the end of the course with attention to ensure aptitude among the students to make them ready for the complicated and dynamic requirements of industry 4.0.

Important Points to remember:

- **These mini-projects are optional but have an immense impact! So it is strongly recommended for all students.**
- **Students may form a group. However, the number of students in a group should be at most three (3). In addition, in the case of a multi-partner contribution, every individual contribution must be specified unambiguously. Single-handed execution is desirable.**
- **Student/student(s) must have to write their philosophy behind the program in an unequivocal manner.**
- **A graphical abstract of the overall program in the flowchart should be given.**
- **Students are expected to suggest improvisations on the selected topics or share some ideas to make them more relevant.**
- **IF MULTIPLE GROUPS SELECT THE SAME TOPIC, THEN EVALUATION FOR THAT TOPIC WILL BECOME STRINGENT! HOWEVER, A COMPARATIVELY LESS ATTEMPTED TOPIC WILL GET A CHANCE FOR LENIENT EVALUATION.**

List of Mini Projects

1. **Write a program that collects data from the open circuit and short circuit test, prints the values of the equivalent circuit parameters, and draws the schematic circuit diagram of the transformer with parameter values. Try to design a GUI for the same.**
2. **Write a program that collects a transformer's loading conditions and equivalent circuit parameters, calculates the efficiency, and recommends the user for a power factor correction to get the best efficiency performance. Try to design a GUI.**
3. **Write a program that collects the details of the equivalent circuit parameters of a transformer, calculates the voltage regulation for given load conditions, and plots the Kapp Regulation circle for the transformer. Try to design a GUI for the same.**
4. **Write a program that collects details of the participating transformers (in case of parallel operations) and gives the details of the percentage of load sharing among the**

individual transformers for a specific loading condition. Try to design a GUI for the same. Try to design a GUI for the same.

5. Write a program that collects details of two winding transformers, depending on the users' configuration choice. It prints the details of the specification of the auto-transformer that will be configured by connecting the two-winding transformers as per the user's description. Try to design a GUI for the same.
6. Write a program that will collect the phase impedances of any arbitrary three-phase balanced or unbalanced load and calculate the possible voltage regulation and current in both primary and secondary winding. Make your algorithm flexible enough to deal with any transformer configuration. Try to design a GUI for the same. (Hints: You may use the sequence networks' help to analyze regulations for your transformer configuration. For the sake of simplicity, consider transformer bank!)
7. Write a program that asks users to conduct practical tests to provide the necessary inputs to the program. Then the program will determine the impact of third harmonic content on any specific transformer bank configuration provided by the user. Try to design a GUI for the same.
8. Write a program to anticipate the fall in efficiency due to the unbalanced loading of a three-phase transformer bank. (Hints: You may confine yourself only to the case studies of star/delta, delta/star, delta/delta, star/star, and both four-wire and three-wire configurations for the star side.) Try to design a GUI for the same.
9. Write an algorithm to find the suitable winding configuration for three-phase to multi-phase transformers. (Hints: Consider the following conversions to three phases to two phases, five phases, six-phase, and seven phases. KEEP THE kVA CONSTANT!) Try to design a GUI for the same.
10. Write an algorithm to find out the improvement of torque profile in a DC series motor due to the presence of the interpole winding, and in addition, find out the heat loss taking place in the interpole winding. Finally, compare the efficiency. Try to design a GUI for the same.
11. Write an algorithm asking the user for relevant information about a machine and calculate the magnetic pull on the rotating shaft. Try to design a GUI for the same.

12. Write an algorithm to determine the conductor placement for any arbitrary winding configuration. (Hints: Consider all possible cases.) Try to design a GUI for the same.

13. Write an algorithm that asks the user to provide the space variation of the flux density waveform and predict the shape of induced emf across the phase windings. Try to design a GUI for the same. (Hints: You must first convert the flux density variation graph into an array, and then Fourier analysis of the same is required. Upon obtaining the magnitude, you may drop harmonics whose magnitude is less than 5% of the fundamental phase wave magnitude.)

14. Write an algorithm to plot the emf waveform for a particular winding of a three-phase alternator for any arbitrary balanced loading. (Hints consider the armature MMF for finding out its effect on the resultant waveform. Feel free to take suitable assumptions; however, you must defend your assumption by providing cogent logic). Try to design a GUI for the same.

15. Write an algorithm to calculate the torque generated by any arbitrary three-phase motor and consider harmonic torques, too (if any). (Hints: Feel free to take suitable assumptions; however, you have to defend your assumption by providing cogent logic)