

CIRCUITRON

The Electronic Circuit Designing



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Aim: Provide feasible solutions to a set of problems based on harnessing and application of renewable energy.

Introduction:

With increasing energy crisis, the efficient production and distribution of energy is imperative. The production of renewable energy is important for energy security as well as for its environmental benefits. But there are technical problems in harnessing and applications of these energy forms. For example, solar power is used to charge batteries so that solar powered devices can be used at night. However, the batteries are large, heavy and need storage space. They also need replacing from time to time. Thus the present technology in renewable energy production is not adequate to meet growing needs.

The problem of electricity in villages of India is even severe as energy from power grids is mostly diverted to industries. Also there is transmission loss in providing electricity to remote villages from these power grids. There is hence a need to find an alternative method for providing electricity to the villages. Mini Smart Grids have been evolved as a solution to these challenges. A Mini Smart Grid uses diverse range of energy resources such as solar PV, hydro power plants, wind turbines, bio diesel generators etc in combination with each other. But it involves a very advanced control technology for optimum efficiency of the overall system.

Through concepts like Mini Smart Grid for villages and battery less usage of solar energy, this event seeks to counter the problems in efficient application of renewable energy. Similarly there are problems in present equipments like Micro Wind Generator or an Induction Motor which demand innovative solutions.

The problem statement of this event has been provided by Digitech Renewable Energy Development Organisation (DREDO), an organization dedicated to renewable energy production.



PROBLEM STATEMENT

1. Electronic Circuit for a Mini Smart Grid

There is a Mini Smart Grid [1000 watt - 10,000 watt] to be made for small community or a remote village which doesn't have accessible Government EB power available; there the mini smart grid will be a boon as it can create various opportunities with minimum investment.

For this, the input power will be generated from three sources:

- (i) Wind turbines
- (ii) Hydro turbines
- (iii) Bio diesel generator

There are the following scenarios.

- (a) If the Power is generated from all Sources.

Then the smart grid tied Inverter will have to sense the load that is being used in the community and accordingly have to take the decision to divert the excess load to the central grid and since Bio-diesel is a limited source of power, it has to command the bio-diesel generator to shut down.

- (b) If it is peak summer, then the priority would be in the following order:

- (i) Wind
- (ii) Bio-diesel
- (iii) Hydro

- (c) If wind is not available, then it has to automatically chose from either of the two – Hydro and Bio-diesel.

With the grid tied Inverter available, the task is to make a circuit which can be interfaced with the inverter and it has to be programmed to act accordingly as mentioned above. It has to employ electronic phase synchronizer as there will be a mixed input of three phase and single phase as output source.



2. Electronic Controller for Micro Wind Generator

This problem refers to wattage from 300 watt to 2000 watt.

The concept is like this: In a high Rpm micro wind generator that is manufactured, a PMSG is used as the generator, which is capable of generating required power at RPMs around 500 to 1000.

The task is that a circuit has to be developed to monitor the RPM of the shaft / Blade, and accordingly it has to adjust the frequency and has to supply a constant voltage along with that. If in case the RPM exceeds the rated RPM then it has to isolate the load connected from the power generated so that the internal coil cannot be damaged.

3. Battery less conversion of DC to AC (up to 1000 watt only)

In this problem, the power generated from the solar panel has to be converted into 220vac ,and the circuit has to constantly vary the frequency with respect to the fluctuating load and solar power.

With this system, the use of battery can be terminated; hence we can reduce the investment and as well save the environment from hazardous Lead.

4. Any technique to reduce the initial start up current in an induction motor.





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JUDGING PARAMETERS:

- **Feasibility:** The ideas should be implementable. It should have the ability to be practically executed in projects.
- **Presentation:** The circuit diagrams and its working should be clearly shown in the presentation round. The presentation should be clear and easy to understand.
- **Innovation:** Certain problems specifically demand novelty. Creativity displayed in developing algorithm and use of components would be appreciated.
- **Understanding:** This would be based on the Q&A session where judges would ask questions related to the presentation.

