PROJECT ABSTRACT

Resistive Load Bank for Generator Testing with Step Load Switching

A ventilated resistive load bank with stepped nichrome loads, panel meters and a cooling fan for generator regulation and step-load tests. Delivered built-to-order with the bank, procedure manual, report, PPT and viva Q&A.;

01. Title

Resistive Load Bank for Generator Testing with Step Load Switching

02. Introduction / Background

A generator is only proven when loaded: voltage regulation, frequency stability and thermal behaviour under step loads are the acceptance tests every generating set must pass, and the instrument that performs them is the load bank. Students study regulation curves in machines theory but rarely apply a real measured load to a real generator and watch the governor and AVR respond. This project builds that instrument — a ventilated enclosure with stepped nichrome element banks, front-panel switching, panel voltmeter/ammeter and a cooling fan — so the student performs the standard loading test on student-built hardware.

03. Problem Statement

Generator regulation is taught as a curve while the act of loading a generator stays theoretical for most students. The project addresses this with a proper test instrument: calibrated load steps, direct metering and a written step-load procedure that turns the acceptance test into a student experiment.

04. Objectives

- Provide stepped resistive loads (combinable to ~5 kW) via panel rotary switches.
- Meter load voltage and current directly on panel instruments.
- Cool the enclosure with forced air plus a thermal-cutout interlock.
- Terminate high-current connections safely with brass lugs and high-temp wiring.
- Guide the student through no-load to full-load regulation measurement.
- Support qualitative step-load transient observation.
- Deliver the bank, manuals, workbook, report, PPT and viva Q&A.;

05. Proposed Methodology

The bank is fabricated as a ventilated MS enclosure with nichrome coils on ceramic insulators grouped into switched sections. The student connects it to the generator under test, records no-load voltage, then switches load steps in sequence, recording V and I at each settled step up to rated load. The regulation curve is plotted from these readings; a

sudden step-off demonstrates transient response qualitatively, and a timed run logs thermal behaviour before the cool-down procedure.

06. System Architecture / Working

Each rotary switch connects a bank of nichrome elements across the supply terminals, drawing a known resistive current. The panel voltmeter reads terminal voltage and the ammeter reads total current at every step. The generator's AVR and governor respond to each switching event; the student records the settled values that form the regulation curve, while the fan and thermal cutout keep the enclosure within its thermal design.

07. Hardware / Software Requirements

- Ventilated MS enclosure with element frame
- Nichrome heating-element banks on ceramic insulators
- Heavy-duty rotary step-load switches
- Analog panel voltmeter and ammeter
- Cooling fan with thermal cutout interlock
- Brass terminal lugs and high-temperature wiring
- Step-load test procedure manual
- Regulation-curve workbook and fabrication drawings

08. Expected Outcomes

- A measured voltage-regulation curve for the test generator from student readings.
- Documented step-load transient observations.
- Thermal run data with cool-down discipline demonstrated.
- A complete report, PPT and viva Q&A; on regulation, load banks and test safety.

09. Applications

- Electrical-machines teaching laboratories.
- Acceptance-style testing of small generators and portable DG sets.
- Demonstrating AVR/governor response to students.

10. Future Scope

- Inductive section for reactive-power loading tests.
- Digital power/energy metering with data logging.
- Three-phase version for larger machines.
- Automated step sequencer with timed intervals.