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Status of Research and Development in India and Strategies to Promote Research in Technical Institutions

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Abstract

The country has major challenges to address in health, food, energy and environment and these can be met by doing quality science, showing greater inventiveness and achieving quality in product innovation. Research and development has become imperative in present context. Goals of research and innovation need to be linked to goals of national development and priorities. At present, expenditure on R&D is less than one percent of the GDP, which needs enhancement. The number of PhDs produced is about 9000 while the corresponding figures for China and USA are 50000 and 25000 respectively. Technical education has to play an important role in developing among the youth the needed competence to reap the benefit of opportunities of R&D lying ahead in the country as major sectors of economy are likely to show remarkable growth in the coming years. There are a number of issues in problems due to which R&D activities are lagging behind. These include: inadequate contribution of industry in R&D, lack of networking among technical institutions, lack of interaction and collaboration between industry and academia, meager incentives and scholarships, lack of conducive environment for experimentation and innovation etc. Technical institutions can give a boost to R&D by adopting some of the strategies that have proved successful or has the potential to do so. These strategies include: offering innovative MTech and PhD programmes in collaboration with industry, research organizations or foreign organizations or institutes; faculty and student exchange programmes, creating environment for experimentation & innovation; providing incentives for research; involving students in consultancy and sponsored research projects; encouraging industry to set up incubation centres; promoting research in teaching; encouraging student to publish papers and training of faculty and students in the areas of research and intellectual property rights & patenting.

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Optimization of Thermoelectric Engines by Harvesting Waste Heat Energy from Automobiles using a Chemical Reaction Controlled Prototype Model

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Abstract

Thermoelectric couples (TECs) made up of bismuth telluride (Bi_2Te_3) were connected in series to form a thermoelectric generator (TEG) having a ZT value of 0.65. The prepared matrix was then subjected to different temperature gradients generating a voltage of around 1V at a temperature difference of 74°C and 2V at temperature difference of 110°C. Constant and variable temperature profiles using electrical and chemical heating were used to mimic the automobile radiator conditions to study the TEG behaviour. Breakaway point was observed at 130°C, generating maximum power at that point. A linear graph with negative slope was obtained for efficiency vs temperature of cooling air, converging towards the conclusion that maximum efficiency can be obtained by keeping the cooling air temperature (CAT) as low as possible. This TEG – radiator system generated about 6.5kJ of energy at CAT of 300K thereby reducing the fuel consumption by 5-7%.

Keywords: Temperature gradient, thermoelectric generator, thermoelectric couple, ZT value, Seebeck coefficient.

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Implementation and Code Generation of Digital Circuits and System Using MATLAB & SIMULINK

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Abstract

The software packages and simulators play a pivotal role in engineering and research for the development of broad diversity of complex engineering problems. Presently, one of the versatile domains of electronics and electrical engineering *i.e.* digital circuits and system play a pivotal role in modern era. The concepts of modeling and analyzing the behavior of digital circuits and system are extremely challenging. The present paper describes to analyze digital circuit and system and process a Simulink block diagram model in order to generate VHDL code with particular output waveforms and then implementing and verifying the design on FPGAs or CPLD or ASICS. This can be achieved by porting the netlist i.e. output of synthesis of Simulink system description into VHDL. In Simulink, digital circuit and system model can be created via the logical bit operation library. The present communication will provide an exposure of MATLAB & Simulink for model of a system such as combinational circuits half adder and full adder as well as their VHDL code generation.

Keywords: Digital Circuit and System, MATLAB, SIMULINK, VHDL Code Generation.

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Evaluation of Pullout Friction at Soil and Nail Interface

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Abstract

Soil nailing technique is an innovative and emerging in-situ ground improvement technique in which nails are inserted into the ground to increase its overall strength and restrain its displacement. The basic principle of transferring the resisting tensile forces generated in the nails into the ground through the friction mobilized at the interface of soil and nail (pullout friction). In order to evaluate this parameter and its influence on diameter and length of soil nail with varied surcharges, a study has been carried out on laboratory pullout tests on single nail with a rate of pull of 1mm/min (FHWA) by varying the diameter and embedded length of the nail along with surcharge. This paper presents the typical results of pullout test on sand under various conditions.

Keywords: soil nail, pullout test, surcharge, interface friction and slope.

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Nanotechnology- Scope, Applications and Challenges

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Abstract

During the past few decades, a lot of discussion has emerged on the importance and adverse effects of nanotechnology and its applications, which is still going on. The reason is attributed to the productive and disruptive effects of this technology which deals with matter at a nano scale. Nano-particles have tremendous applications in catalysis, separation technology, basic and applied sciences, health care and medicine due to their peculiar characteristics which differ from conventional materials. The important facet is the approach behind this technology which employs fundamental sciences along with materials science to engineer nanomaterials. Nanomaterials are fabricated based on different approaches; physical and chemical methods are employed to get different functionalities based on potential applications. The paper discusses the preparation techniques; properties achieved by different methods, targeted applications of nanostructured materials and current issues in nanomaterial synthesis. Some new developments in the field have also been enlisted.

Keywords: nanomaterials, nanoparticles, physical methods, chemical methods, composite materials.

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Design and Analysis of Internal Model based Voltage Feed-forward MPPT Controller for Solar Photo-voltaic System

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Abstract

Abrasive flow machining is a non-conventional machining process and was developed as a method to deburr, polish and radius difficult to reach surfaces such as intricate geometries by flowing a semi-liquid paste over them. Abrasion occurs wherever the medium passes through the highly restrictive passage. The key components of AFM process are the machine, tooling and abrasive medium. The AFM is capable of economically producing high surface finish. One serious limitation of this process is its low productivity in terms of rate of improvement in surface roughness. Till now limited efforts have been done towards enhancing the productivity of this process with regard to better quality of work piece surface. In recent years, hybrid-machining processes have been developed to improve the efficiency of such processes. This paper discusses magnetic force as a technique for productivity enhancement in terms of percentage improvement in surface roughness (Ra). The magnetic force is generated around the full length of the cylindrical work piece by applying DC current to the solenoid, which provides the magnetic force to the abrasive particles normal to the axis of work piece. In this paper various parameters affecting the process are described and the effect of the key parameters on the performance of process has been studied.

Keywords: Maximum power point tracking; solar photo-voltaic system; feed-forward controller, internal model based controller.

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A Novel Method for Moisture Determination in Peanut

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Abstract

Accurate determination of moisture content of the peanuts is an important factor for preserving the quality and prevention of spoilage in peanuts. Hence, it is very important to devise rapid methods for determining moisture during harvesting, storage, marketing, and processing of peanuts. This paper deals with a novel method for moisture determination in peanuts using latest analog devices, which make the whole system cost effective as well as compact.

Keywords: Moisture determination; Peanuts; Dry oven method; Capacitance sensor.

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