

1. Il candidato descriva un metodo per la valutazione degli investimenti, delineando la procedura di calcolo, i dati di input, gli indicatori di output ed i criteri decisionali, illustrandone poi vantaggi e svantaggi

Il candidato descriva un tipo di software utilizzabile per la stesura di relazioni tecniche o articoli scientifici.

Il candidato legga e traduca:

The heart of all electric drive trains is their power electronic converter, which processes and controls the electrical energy flow from the battery to the machine. During the next decade, converters are going to be further integrated in the motor [2] and reduced in size and cost to increase their potential on the market. This path must be pursued without making any compromise with respect to the reliability and the lifetime of the converter. The aging of converters is dominated by thermomechanical degradation of the power module, particularly the bond wires, solder, and sinter interconnects [3].

(Text extracted from: C. H. van der Broeck, L. A. Ruppert, A. Hinz, M. Conrad, R. W. De Doncker "Spatial Electro-Thermal Modeling and Simulation of Power Electronic Modules", IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS, VOL. 54, NO. 1, JANUARY/FEBRUARY 2018)

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2. Il candidato illustri i concetti di affidabilità e disponibilità di un sistema, indicando le strategie di manutenzione più idonee in relazione alla tipologia di guasti infantili, casuali e per usura

Il candidato descriva un tipo di software utilizzabile per la preparazione di presentazioni a conferenze o meeting di gruppo.

Il candidato legga e traduca:

There are several modeling methodologies, which can be applied for that purpose. The most convenient method is to extract the thermal impedance either experimentally [4] or with finite element method (FEM) simulations [5] and to use it for the determination of the junction temperature based on a thermal equivalent circuit. This methodology can be improved according to [6], taking into account thermal cross coupling between different heat sources. However, for these approaches, it is either required to perform measurements or to construct an FEM model and to perform simulations before the model can be extracted from the results.

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3. Ipotizzando di dover gestire un progetto di ricerca o tecnologico, il candidato discuta delle metodologie per la pianificazione ed il controllo di tempi, costi e qualità.

Il candidato descriva un software utilizzabile per l'archiviazione di dati, statistiche, per fare grafici o tabelle.

Il candidato legga e traduca:

An alternative way is to use the finite-difference method (FDM) to construct a spatial thermal state-space model of the power converter, which has been applied in various domains, e.g., for the thermal simulation of power modules [7], [8] and electrical motors [9]. A loss model is derived and parameterized based on loss measurements and data sheet information. The electro-thermal converter model is evaluated based on experiments and integrated in a time-efficient drive train simulation of an electric car, which is fed with standardized driving cycles. The resulting spatial temperature distribution can be used to evaluate the thermal stress at different design elements of the converter.

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