Abstracts of Papers in English

PREDICTION OF GLOBAL SOLAR RADIATION IN KERMAN USING GEOMETRICAL, ASTRONOMICAL, GEOGRAPHICAL AND METEOROLOGICAL PARAMETERS

M. H. Saffaripour
M. A. Mehrabian
Dept. of Mechanical Engineering
Shahid Bahonar University

Key Words: global radiation, sunshine hours, relative humidity, dew point temperature, linear regression, coefficient of correlation.

Abstract

In this research, the monthly mean daily global solar radiation in Kerman was predicted, using geographical, geometrical, astronomical and meteorological parameters. The measured data of global solar radiation, obtained from the Iranian Meteorological Organization (IMO), were used and the predicted results were compared against them. The analysis of measured data showed that the monthly mean daily global solar radiation on a horizontal surface is correlated with seven geographical and meteorological variables.

The above variables were incorporated in a multiple regression relation predicting monthly mean daily global solar radiation on a horizontal surface. The global solar radiation model developed in this research, whose accuracy was validated when compared to measured data, can be used in regions where meteorological stations are not available and, therefore, where measured data do not exist. In this case, using the model requires only to know the seven parameters mentioned above, the measuring of which does not require a meteorological station.

INVESTIGATION OF THE NONLINEAR VIBRATION OF A CABLE- MASS SYSTEM, DUE TO THE MOTION OF AN ATTACHED ACCELERATING MASS

A. R. Shahani
M. Ghadiri
Dept. of Mechanical Engineering
K.N.Toosi University of Technology

Key Words: nonlinear vibration of cable, moving mass, galerkin method, average acceleration method.

Abstract

In this paper, the nonlinear vibration of a cable supporting a moving mass which is connected to the cable via a spring and a damper has been investigated. One end of the cable is fixed and the other one, with different height with respect to the first end is not fixed, and the cable can experience the variation in length in such a manner the tangential strain of the cable at each time remains zero. Planar vibrations of the cable in the vertical direction are considered. The governing equations of the motion are solved numerically and the obtained results

are compared with those of the linear vibration. The results of present research are applicable in the analysis and design of the cable of telecabines, cable cranes etc.

NUMERICAL SOLUTION OF CONJUGATE MIXED CONVECTION AND RADIATION IN A HORIZONTAL ELECTRONIC BOARD WITH RECTANGULAR HEAT SOURCES

A. Behbahaninia
M. Ghasemi
M. R. Shirzadi
Dept. of Mechanical Engineering
K. N. Toosi University of Technology

Key Words: mixed convection, radiation heat transfer, conjugates heat transfer, numerical analysis, horizontal channel, cooling.

Abstract

The numerical solution of cooling air in a horizontal electronic board containing five chips as heat sources is presented. Heat transfer in air is considered as mixed laminar and steady and 2D convection and, in the solid domain, is considered as combined conduction and radiation. Governing equations are discretised by the FV method, radiation heat transfer is modeled with the radiossity/irradiation method and Hottel's crossed-string method is used to evaluate view factors. A comparison between obtained numerical results and existing numerical and experimental results is made and shows the good accuracy of the numerical code. The effect of Reynolds number, Grashof number, aspect ratio and the distance between heat sources and their location, on the hydrodynamic and heat transfer behavior of electronic equipment, is investigated. According to obtained results, the aspect ratio has a considerable effect on the maximum temperature in electronic equipment and, whenever there is a limitation to selecting materials in the thermal designing of electronic equipment, a proper geometrical arrangement can be very useful.

INVESTIGATING THE EFFECTS OF USING PIEZOELECTRIC LAYERS ON THE FREE AND FORCED VIBRATIONS OF FGM PLATES

M. Shariyat
I. Aminaee
Dept. of Mechanical Engineering
K.N.Toosi University

Key Words: vibration, FGMplate, piezoelectric, active control, finite element method.

Abstract

In the present paper, the effects of using piezoelectric sensor and actuator layers on the vibration of FGM plates are investigated. In this regard, free vibration, forced vibration and active control of the transient vibration are studied. In the free vibration analysis, natural frequencies and mode shapes are determined. In the forced vibration analysis, the responses of the system are obtained for different inputs and different electric potential fields. The finite element method is employed to solve the governing equations. It is noticed that the piezoelectric layer has minor effects on the natural frequencies and no effect on the mode shapes. Instead, sensor and actuator piezoelectric layers may be used in active control of the transient vibrations of the systems without performing any modifications on the vibration parameters.

APPLICATION OF RETURN MAPPING ALGORITHM IN ANALYSIS OF PRESSURE VESSELS WITH NONLINEAR KINEMATIC HARDENING BEHAVIOR

A. Nayebi
Dept. of Mechanical Engineering
Shiraz University
K. Naderan Tahan
S. Bazdar
Dept. of Mechanical Engineering
Shahid Chamran University of Ahvaz

Key Words: return mapping algorithm, elasto–plastic deformation, pressure vessels, cyclic loading.

Abstract

Stress — strain analysis of pressure vessels has an important role in their design. The choice of the numerical method is very importand in elastoplastic analysis. Return mapping algorithm is a powerful numerical method in the elastic-plastic analysis of nonlinear problems which consists of two steps of elastic predictor and plastic corrector. In this research, the return mapping algorithm is developed to analyze a thick cylinder under internal cyclic pressure. The material behavior is considered to be nonlinear kinematic hardening and the yield criterion is the Von-Mises function. Variation of the radial and tangential stresses and strains were obtained. The results obtained by this algorithm are com-

pared to those obtained by finite element method and a good agreement is observed.

NUMERICAL STUDY OF PULSATING FLOW AND HEAT TRANSFER IN A PIPE PARTIALLY FILLED WITH A POROUS MEDIUM

H. Sayevand
Dept. of Mechanical Engineering
Bu-Ali Sina University, Hamedan
H. Shokouhmand
Faculty of Engineerin
Dept. of Mechanical Engineerin
University of Tehran

Key Words: pulsating flow, frequency, phase lag, partially filled, permeability.

Abstract

The objective of the present work is to perform a detailed numerical study of pulsating flow and heat transfer characteristics in a pipe partially filled with a porous medium. The Brinkman-Forchheimer-extended Darcy model is adopted for the porous matrix region, which is attached at the pipe wall and extends inward, toward the centerline. The effects of the Darcy number, Da, the thickness of the porous layer, S, and the thermal conductivity ratio, R_k, as well as the pulsating frequency and the amplitude, are investigated. The results showed that as the thickness of the porous layer increases or the Darcy number decreases, the pressure drop grows. It was found that the dependence of the Nusselt number, ν, on S is not straightforward. For a higher thermal conductivity of porous material, the Nusselt number increases, monotonically, with increasing S, while, for a lower value of R_k, a minimum exists in the distributions. The enhanced longitudinal heat conduction, due to pulsating flow, is also examined. The maximum effective thermal diffusivity is found at a critical thickness of the porous layer.

MODELING OF TWO-PHASE FLOW IN POROUS MEDIA BY MIXED-HYBRID FINITE-ELEMENT METHOD

K. Goodarzi
B. Firoozabadi
Dept. of Mechanical University
Sharif University of Technology

Key Words: porous media, mixed-hybrid finite element, two-phase flow.

Abstract

In this paper, two-phase flow equations in porous media were solved by the mixed-hybrid finite-element method. By using the definition of global pressure and global velocity, the governing equations were changed to a simpler numerical form. Consequently, the obtained pressure and saturation equations have less dependence on each other and the velocity appears in the saturation equation expilicitly. The Hybrid method solves the pressure and velocity equations simultaneously. Therefore, the velocity and pressure fields have the same order of accuracy. In this work, the saturation equation was also discretized, by the hybrid method. The above method was used in one and two-dimensional test cases. Results show that predicted parameters, especially in coarse grids, are closer to the exact solution, in comparison with other methods.

DESIGN OF A MULTI-FINGERED GRIPPER FOR CYLINDRICAL OBJECT MANIPULATION

H. Sayyaadi
M.Aghababaie
Dept. of Mechanical Engineering
Sharif University of Technology

Key Words: three finger hand, rolling contact, convex optimization, kinematic simulation, dynamic simulation.

Abstract

One of the most important issues in multi fingered gripper is dexterous maneuver. In this research work manipulation of a cylindrical object is considered via three fingered hand. Rolling contacts between the fingers and object are modeled properly in work space using exponential approach. Initial and final maneuver path in the involved work space is designed and the mission approaches very well for this purposes. Since the motion of the fingers for rolling task is in very finite course, a very powerful method considering quasi static approach is utilized here, and the simulation results show the stability performances of the controlled object obviously. Deriving of the optimal contact forces had been developed by convex optimization and verification of these forces are validated by MATLAB software. Finally dynamics behavior of the finger typed robot considering all contact kinematical restrictions and the other effects are tested and results are depicted well.

THE EFFECT OF RESIDUAL STRESSES ON THE FATIGUE BEHAVIOR OF ROTARY COMPONENTS