Abstracts of Papers in English

ASSESSMENT OF UNSTABLE BUCKLING BEHAVIOUR IN SHALLOW RETICULATED DOMES AND PRESENTATION OF A METHOD FOR ANALYSIS OF THE POST-BUCKLING PATH

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Key Words: primary path, bifurcation path, limit and bifurcation points,tangent stiffress matrix, shallow reticulated dome.

Abstract

For design purposes, the stability of any structure being designed is of paramount importance. The fact that it is possible to perform an analysis on a space structure, which shows that the stresses in that structure are all below those permissible for the materials used in its construction, is, in itself, no guarantee that when the structure is loaded it will not collapse. In order to determine this, it is necessary to find out if the structure is stable under the action of the applied loads.

The secondary paths, especially in unstable buckling, can play the most important role in the collapse of the structure.

In this paper, an attempt is made to automatically calculate the bifurcation path of shallow lattice domes. This calculation is performed in a two–stage analysis of the space structure, without introducing any geometrical imperfections. The method is implemented in a combined materially and geometrically nonlinear finite element analysis computer program, based on an incremental /iterative Newton–Raphson solution procedure. In the first stage analysis, the proportional live load factors, at which critical points occur, are determined and the primary path is obtained. In the second stage analysis, the perfect structure is led towards the lowest bifurcation path, using the technique described in the paper. The resulting theoretical predications are verified by existing experimental observations on a model dome.

AN ANALYSIS THE WILLINGNESS TO PAY FOR GASOLINE PRICES

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Key Words: willingness to pay, fuel price, two - stage probit models, ordered models.

Abstract

Low gasoline prices in Iran, as well as the high rate of car ownership, have been the main reasons behind increased air pollution, network congestion and other relevant problems in Iranian large cities for a number of years.

As it is clear that relevant changes would affect individual mode of life choices and their resulted demand, the effects on the supply side are also noticeable. In this research, an attempt has been made to analyze the "willingness to pay" concept for gasoline prices and to investigate the effect on the fuel demand function. The stated preference data, gathered through a post-back method questionnaire, provided the required data for modeling the "willingness to pay" for gasoline prices for the city of Tehran. A one-stage ordered Probit and a two-stage (binary and ordered) Probit model have been calibrated in an extensive model development process.

From the results of the developed models, one can determine the society's willingness to bear the new gasoline price. The results of the "willingness to pay" models showed that high levels of education, professional status, age and ownership of expensive car models have positive effects on "willingness to pay". The distance between origin and destination is the major variable that negatively affects a higher fuel price. The results also indicate a rather higher "willingness to pay" in Iran (Tehran) compared with other countries. No significant difference was observed between the one-stage and the two-stage modeling processes.

SHAKING TABLE STUDY OF A CONFINED BRICK MASONRY BUILDING

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Key Words: shaking table, confined masonry building, bond beam, tie column, opening

Abstract

A single storey, full-scale unreinforced confined brick masonry building was designed, based on Standard No. 2800 of IRAN, and constructed on the shaking table at the Earthquake Engineering Research Center, EERC, of Sharif University of Technology. The model consisted of a vertical reinforced concrete tie column and horizontal steel bond beams and had a jack-arch roof system. The walls had openings of different dimensions, making it possible to investigate the effects of the shape, geometry and location of the openings. The model was subjected to some seismic experiments, consisting of scaled records of the Bam, Tabas and Elcentro earthquakes as well as harmonic acceleration with a gradually increasing amplitude. The results indicated that the proper workmanship of ties, especially the proper connection of tie columns and bond beams, plays an important role in the integrity and stability of the structure. The creep of the masonry walls and subsequent reduction in frictional resistance between the walls and steel bond beams were effective on the out-of-plane failure of the brick walls.

ANALYSES OF PILED RAFT FOUNDATION AND COMPARISON OF TWO DESIGN PHILOSOPHIES FOR PILE GROUPS

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Key Words: pile, piles group, analysis. design, settlement reducing piles.

Abstract

In the presented research, an analytical study of piled raft foundations is undertaken and two design philosophies for pile groups are investigated. In each case, soil and piles participate in the load resistance of the system. FLAC3D software is used in the analysis of piled rafts and freestanding pile groups. Regardless of the selected method of analysis of the pile group, the used design philosophy has great importance. Conventional and modern (Settlement Reducing Piles) design philosophies are investigated in the research. Also, the effect of the shear modules of soil and allowable settlement in the number of required piles are investigated in each design philosophy.

FACE PRESSURE IMPACT OF EPB SHIELD TUUNELLING ON SURFACE

SETTLEMENT AND GROUND HEAVING

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Key Words: face pressure, EPB, settlement, heaving, tunnel excavation.

Abstract

Before underground excavation, appropriate information is available to determine construction requirements and maintanance systems. However, this sort of information is not enough and the excavation is likely to encounter unpredictable damage. Resulted damage may inflict irreparable losses on installation and residential zones, in addition to disturbances in the exploitation systems. So, examining different parts and, Especifically, controlling states of stress and deformation will considerably prevent disasters. Different methods of determining face pressure are evaluated. Plaxis-3D software is applied to measure the face pressure and the resulted settlement and heave on the ground surface are discussed in this paper. For this purpose, the Esfahan subway information is used as a case study.

ASSESSMENT OF TSUNAMI GENERATION POTENTIAL AND PRESNTING A TSUNAMI WARNING SYSTEM FOR SOUTHERN COASTS OF IRAN BORDERING THE INDIAN OCEAN

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Key Words: tsunami, makran.

Abstract

After the 26 December 2004 mega-tsunami in the Indonesia coastlines, wide efforts were devoted to assess the hazard of tsunami, and to develop tsunami warning systems in the Indian Ocean basin. Based on these efforts, two main tsunamigenic sources that can trigger tsunami-generating earthquakes in the Indian Ocean basin have been identified as the Indonesian subduction zone in the east and the Makran subduction zone (MSZ) in the north of the Indian Ocean. MSZ is located off the southern coasts of Iran and Pakistan in the northwestern Indian Ocean and any possible tsunami from this zone has the potential to affect Iran, Oman, Pakistan, and India. The last major historical earthquake and tsunami in the MSZ occurred on 28 November 1945 killing more than 4,000 people along the Makran coast. Therefore, considering the hazard of tsunami in southern coasts of Iran bordering the Indian Ocean, in this study the potential for tsunami generation in this region has been investigated using modeling of tsunami generation phase. In this regard, a computer program based on Mansinha and Smylie (1971) formula has been developed to predict the seafloor deformation due to underwater earthquake occurrence. The results obtained here show that the risk of tsunami generation from MSZ can be classified into three main categories, as follows: (1) very little risk for tsunami generation in the case of occurrence of an earthquake having magnitude up to 7; (2) little to medium risk (Magnitude ranging 7 to 7.5); and (3) high risk (Magnitude greater than 7.5). At the end of the paper, considering the results of our tsunami hazard assessment, the necessity for development of a tsunami warning system for southern coasts of Iran is emphasized and the structure, components, and mechanism of such a system is presented.

DETERMINATION OF PRE-SLIDING GEOMETRY IN LANDSLIDES CONSIDERING LANDSLIDE OF MOHAMMAD ABAD-JIROFT

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Key Words: landslide,topography of pre- sliding,back analysis, regressive functions, surfer8

Abstract

One of the most critical steps in analysing the stability of slopes is to detect and measure the shear strength parameters which are added at the fracture point. Shear stress parameters are expected to be more than the shear strength parameters along the surface.
To detect the shear strength parameters of a slided slope, there is a need to know the pre- sliding geometry. Having the pre-sliding geometry, it is possible to detect the shear strength parameters at the fracture point by means of a Back Analysis technique and to investigate the present properties of the slope and other slopes of that region.
In this article, in order to get the pre-sliding geometry,

by means of the existing geometry and, also, the same slided points, an exponential regressive function is used and the geometry is simulated by Surfer 8 Soft ware.

MINIMIZATION OF THE EXIT CURVATURE OF NON-SYMMETRIC SECTIONS IN EXTRUSION PROCESS, USING BEZIER CURVES

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Key Words: extrusion, exit curvature, upper bound, Bezier.

Abstract

In this study, an analytical method is proposed for determination and minimization of the exit curvature in extrusion dies. The stream lines are determined by using the Bezier formulation. The improved Bezier formulation is achieved by adding some parameters to the stream line equations and the non-uniform velocity field is extracted from the improved Bezier formulation. By defining the exit curvature criteria, the die is optimized, according to the Bezier coefficients and eccentricity values. For verification of the proposed procedure, the exit curvature of some selective dies is calculated by using Abaqus FEM Software. The FEM results show good agreement with the proposed procedure. Finally, the extrusion pressure of the dies is calculated, based on the minimum energy consumption criteria, according to the upper-bound method. Then, the estimated pressures, according to the minimum curvature and minimum energy criterion, are compared.

FINITE ELEMENT ANALYSIS OF DYNAMIC CRACK GROWTH USING REMESHING TECHNIQUE IN A DCB SPECIMEN UNDER LOADING CONDITIONS OF FIXED-DISPLACEMENT AND FIXED-LOAD

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Key Words: DCB, dynamic crack propagation, finite element method, remeshing.

Abstract

Dynamic crack propagation and arrest phenomena have been considered in this paper. Finite element simulation, based on the remeshing technique, has been used to analyze the mode I fracture problem in a DCB specimen. A plane stress condition is invoked in the present two dimensional analyses. Specimens have been made from an Araldite-B polymer, which is a brittle material. Both fixed load and fixed displacement loading conditions have been used to investigate their effects on the fast fracture. A dynamic fracture toughness criterion has been employed to find the crack propagation velocity and crack tip location at each time step. According to the new crack tip position, a remeshing technique has been used, based upon this new position, and, then, nodal data is transferred from the old mesh to the new mesh, according to the elements shape function. The ANSYS 7.0 standard finite element code and related APDL programming facilities have been employed for modeling the problem. Comparison of the predicted results with those cited in the literature has shown good agreement.

CHARACTERISTIC EFFECTS OF A TWO-FLUID NOZZLE ON ELECTRICAL CHARGING OF A SPRAY

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Key Words: two-fluid nozzle, induction charging, liquid spray, charged droplets.

Abstract

Electrohydrodynamic characteristics of an inductive two-fluid nozzle have been investigated. The nozzle has been examined using an experimental setup in order to supply simultaneous and steady lines of compressed air, liquid feed and high voltage. The compressed air pressure plays a crucial role in the air and liquid flowrates, whereas the charging voltage shows no significant effect on the flowrates. Although an increase in the air pressure exhibits a positive role on the spray charging, by forming a dielectric layer on the charging electrode, it weakens the main induction charging, due to the air ionization. The resultant of these two roles provides an optimum air pressure which shifts toward greater values as the charging voltage increases. The liquid flowrate effect appears to cause electrode wetting, which degrades the spray charging efficiency. However, an increase in the air pressure postpones the occurrence of this negative effect to the larger liquid flowrates.

PREDICTION OF PRESSURE DROP DURING SWIRL FOLW BOILING OF R-134A INSIDE A HORIZONTAL TUBE

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Key Words: pressure drop, two phase flow, twisted tape, boiling, R-134A.

Abstract

In the present work, an investigation into pressure drop during swirl flow boiling of refrigerant R-134a inside a horizontal tube has been undertaken. To do so, twisted tape inserts, with twist ratios of 6, 9, 12 and 15 were employed inside the evaporator tube. The test set-up used in this investigation was a well instrumented vapor compression refrigeration system. This set-up consisted of three electrically heated evaporators called pre-evaporator, test evaporator and after evaporator. First, a correlation was developed to predict the pressure drop inside the plain tube by using the experimental data. Then, based on the collected data for the plain tube and the tubes with twisted tape inserts, two correlations were developed to predict the pressure drop inside the twisted tape inserted tubes. The predicted pressure drop by these correlations, fell with an error band of ± 15% of the experimental pressure drop data. Generally, the insertion of twisted tape inside a horizontal tube, increases the pressure drop. In the worst condition, the flow boiling pressure drop increases up to 180% and, as an average, up to 100% relative to plain tube values on a nominal area basis.

DESIGN AND FABRICATION OF IONIC POLYMER-METAL COMPOSITES (IPMC) MICROGRIPPER: A FEASIBILITY STUDY

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Key Words: micro-electromechanical systems, robotic microgripper, ionic polymer-metal composite, artificial muscle.

Abstract

Ionic polymer-metal composites (IPMCs) as actuators and sensors are sometimes referred to as "soft actuators-sensors" or "artificial muscles". Recently, versatile developments have been fulfilled in the fields of fabrication, modeling and application of the aforementioned materials. In addition, the application of micro-electromechanical systems in sensors and actuators is growing rapidly. In this research, some ideas are explored and proposed for the design and fabrication of IPMC microgrippers, based on micromachining technology. This product may have many potential applications in microrobotics technology, especially for operations in biological environments. Finally, the gripping process has been modeled based on the gripper electro-mechanical behavior.

THE STUDY OF THE CONTROL SURFACE FREEPLAY ON THE AEROELASTIC BEHAVIOR OF AIRFOIL USING QUASI-STEADY AERODYNAMICS

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Key Words: control surface freeplay, quasisteady aerodynamic, LCO, aeroelasticity.

Abstract

A combination of the control surface to the wing section is carried out by mechanisms which usually have freeplay. This leads to structural nonlinearity behavior and, as a result, nonlinear aeroelastic behavior. In this study, the aeroelastic behavior of an airfoil with a control surface, which, together, have three degrees of freedom; i.e.: heaving and pitching of the airfoil and pitching of the control surface, has been analyzed in a subsonic incompressible flow regime. A bilinear spring is employed to joint the airfoil to the control surface and a quasi steady aerodynamic model is used for aerodynamic modeling. It is shown that the quasi steady aerodynamic model is not reliable for determination of the aeroelastic behavior and flutter boundary of the airfoil. However, the aeroelastic characteristics of the airfoil can be investigated using such a modeling approach. As another outstanding outline, it is concluded that, often, the instability is of a Limit Cycle Oscillation (LCO) type.

CONCRETE STRUCTURE REHABILITATION USING CABLE SYSTEMS AND OPTIMIZATION OF THE CABLE SYSTEM FORM AND PRE-TENSIONING FORCE RANGE

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Key Words: optimization, relative lateral displacement, cable system, pre-tensioned cables, pre-tensioning range.

Abstract

In this paper, the use of cable systems is investigated, in order to rehabilitate buildings. The first system is a consistent cable system, in which pre-tensioned continuous cables, with sliding connections at the floors of mid-stories, is used to increase structural lateral stiffness. At the end of each cable, a spring damper is used, in order to dissipate the energy. The next system involves X-form pre-stressed cables, which are used as X forms in one, or in multiple, span(s) of a frame. These systems can be replaced with other systems, due to the high tensile resistance of the cable, their ease of replacement, their high speed performance and economy, etc. They can also be used to rehabilitate existing buildings. The pre-tensioning force amount of the cables in these systems should be placed in a specific range. This range has been found for two concrete frames of three and six stories in different cases. Using a consistent cable system, one can easily set the cable lateral stiffness at each story by changing the cable passing position from the story floor. The system was modeled using a SAP 2000 package and the optimum of the cable form was obtained. Comparing flexural frame results with the optimized case cable system showed that the most reduction in relative lateral displacement occurred in the stories which had maximum displacement in the flexural frame system. Finally, comparison of the flexural frame with the cable system showed a considerable reduction in displacement and element internal forces.

DESIGN, FABRICATION AND CONTROL OF A RIGID-WING LAND YACHT MODEL

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Key Words: wing, land yacht, aerodynamics

Abstract

This paper presents the design, fabrication and control of a rigid-wing land yacht. The design of this model, which has been fabricated for the first time in the country, is guided by theory. In general, wind energy provides thrust force for land yachts. Some land yachts use rigid wing instead of soft sail. This wing would generate the main aerodynamic forces that would support and propel the land yacht in a special direction. By adjusting the wing in a proper direction, the land yacht could be moved in a different direction to the wind, even in the opposite direction to the wind. This land yacht is a radio control model that uses two electrical engines for the wing and the steering control mechanism. These two electrical engines are controlled with a four channel radio controller. Regarding the results of present calculations, it is possible to design any size of rigid wing land yacht without any trial and error, as well as reducing the cost of the experiments, which provide the dimensions and dynamic characteristics of the land yachts. Dynamical tests of this model, which are easier than full scale model testing, show that, at true wind speeds of around 10 m/s, the maximum speed of the land yacht exceeds true wind speed by 75%. Also, at the starting point of the movement, at constant true wind speed, the thrust force will have its maximum value when the true wind angle is equal to 90°.