8th Australasian Congress on Applied Mechanics 2014

(ACAM 8)

Melbourne, Australia 25-26 November 2014

Part A

Editors:

Raj Das Sabu John

ISBN: 978-1-5108-0267-4

Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2014) by Engineers Australia All rights reserved.

Printed by Curran Associates, Inc. (2015)

For permission requests, please contact Engineers Australia at the address below.

Engineers Australia Engineering House 11 National Circuit Barton ACT 2600

Phone: +61 2 6270 6555 Fax: (02) 6273 1488

memberservices@engineersaustralia.org.au

Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA

Phone: 845-758-0400 Fax: 845-758-2634

Email: curran@proceedings.com Web: www.proceedings.com

TABLE OF CONTENTS

| IMPROVEMENT IN THE DIAGNOSTICS OF GEARBOX VIBRATION SIGNALS UNDER VARYING SPEED CONDITIONS | |
|---|-----|
| DESIGN AND TEST OF A MULTIPLE-DOF MOTION PLATFORM FOR VIBRATION ANALYSIS OF HEAVY DUTY VEHICLE SEAT SUSPENSION | |
| EXPERIMENTAL INVESTIGATION OF EFFICIENCY LOSSES IN A TWO SPEED ELECTRIC VEHICLE | 23 |
| THOUGHTS ON THE SCATTER ASSOCIATED WITH THE GROWTH OF BOTH SMALL NATURALLY OCCURRING CRACKS AND LONG CRACKS | 33 |
| DEVELOPMENT OF PHYSICAL MODELS TO UNDERSTAND BALLISTIC IMPACT RESPONSE C | |
| EFFECT OF ENERGY ABSORBING MECHANISMS ON THE BLUNT THORACIC TRAUMA CAUSED BY BALLISTIC IMPACTS | 51 |
| THE EFFECT OF NON-ENZYMATIC GLYCATION ON THE FLEXURAL AND FRACTURE PROPERTIES OF BOVINE CORTICAL BONE | 59 |
| A VOXEL-BASED APPROACH TO MESHING WOVEN FIBRE COMPOSITES | 68 |
| EFFECT OF BLANK HOLDER FORCE ON STRAIN EVOLUTION OF FORMING OF STEEL/SRPP FIBRE METAL LAMINATE | |
| BUCKLING BEHAVIOUR OF REINFORCED THERMOPLASTIC PIPES UNDER COMBINED EXTERNAL PRESSURE AND BENDING | 87 |
| ONE-DIMENSIONAL CUF MODELS FOR THE ANALYSIS OF LAMINATED STRUCTURES | 95 |
| STRESS ANALYSIS OF A CRACK NEAR AN ELASTIC LAYER1 | 03 |
| A COMPUTATIONAL INVESTIGATION OF FAILURE MODES IN FIBRE METAL LAMINATES 1 | 12 |
| DYNAMIC DAMAGE ANALYSIS OF COMPOSITES VIA A COMPONENT-WISE 1D APPROACH.1 | 22 |
| WHIPPING ASSESSMENT OF A SCALE WARSHIP STRUCTURE1 | 29 |
| THE EFFECT OF DRILLING MUD DAMPING ON VERTICAL VIBRATIONS OF DEEP ROTARY DRILLING ASSEMBLIES1 | 38 |
| CONDITION MONITORING OF PLANETARY GEARBOXES: MODELLING MESH STIFFNESS IN THE PRESENCE OF PLANET GEAR TOOTH ROOT CRACKS | 47 |
| USING THE HILBERT-HUANG TRANSFORM TO IDENTIFY HARMONICS AND TRANSIENTS WITHIN RANDOM SIGNALS1 | 57 |
| METHODS FOR ASSESSING THE EFFECTS OF ACCUMULATED FATIGUE DAMAGE ON THE FRACTURE RESISTANCE OF CORTICAL BONE1 | |
| A SIMULATION MODEL TO STUDY THE POTENTIAL USE OF MICRO-STRUCTURED SURFACE TO IMPROVE THE TRIBOLOGICAL PROPERTIES OF UHMWPE1 | |
| ABRASIVE WEAR BEHAVIOUR OF MACHINABLE LITHIUM DISILICATE GLASS CERAMIC 1 | 85 |
| CRASHWORTHINESS INVESTIGATION FOR FUNCTIONALLY GRADED THICKNESS (FGT) CIRCULAR COLUMN1 | 91 |
| EFFECT OF CARBON NANOTUBE ADDITIONS ON THE MECHANICAL PROPERTIES OF COMPOSITES1 | 98 |
| CHARACTERISING CRACK GROWTH IN STRUCTURAL ADHESIVES2 | 203 |
| EFFECT OF PROCESS PARAMETERS ON NON-ISOTHERMAL STAMP FORMING OF A SELF-REINFORCED POLYPROPYLENE COMPOSITE2 | 211 |
| MODELLING AND ANALYSIS OF STRUCTURES MADE WITH VISCOELASTIC FUNCTIONALLY GRADED MATERIALS2 | |

| NUMERICAL MODELLING OF SANDSTONE UNIAXIAL COMPRESSION TEST USING A MIX- MODE COHESIVE FRACTURE MODEL | 227 |
|---|-----|
| STATIC SHEAR STRENGTH CALCULATION OF PLASTIC HELICAL GEARS MATING WITH ST | |
| IS CURRENT RUGBY HEADGEAR ADEQUATE? | 244 |
| NONLINEAR MECHANICS OF OPTICAL GLASS IN ITS SUPER-COOLED LIQUID REGION | 252 |
| THE INVESTIGATION OF THE WEAR BEHAVIOURS OF ARTIFICIAL JOINT AT A MACRO ANI NANO SCALE | |

TABLE OF CONTENTS

| DEFORMATION OF A THREE-DIMENSIONAL RED BLOOD CELL IN A STENOSED MICRO-CAPILLARY | 273 |
|--|-----|
| APPLICATION OF SELECTIVE LASER MELTING (SLM) FOR HYBRID AEROSPACE STRUCTURES | 280 |
| NON-LINEAR QUASI-ISOTROPIC MATERIAL MODELLING OF CHOPPED FLAX FIBRE REINFORCED POLYPROPYLENE COMPOSITES IN STAMP FORMING | 289 |
| FINITE ELEMENT ANALYSIS OF A LOWER-LIMB RUNNING-SPECIFIC PROSTHESIS | 297 |
| PROPAGATION OF ELASTIC WAVES IN COMPOSITE MATERIALS WITH INCLUSIONS | 306 |
| CAPABILITIES OF 1D CUF-BASED MODELS TO ANALYZE METALLIC/COMPOSITE ROTORS. | 315 |
| ISSUES WITH THE EXPERIMENTAL CHARACTERISATION OF AUTOMOTIVE SHOCK ABSORBERS FOR VEHICLE DYNAMIC SIMULATIONS | 323 |
| CONCEPT CAE MODELING METHOD FOR NVH VEHICLE STRUCTURE ANALYSIS | 332 |
| SIMULATIONS OF UNDERWATER EXPLOSIONS USING FLUID-STRUCTURE-INTERACTION ANALYSIS | 339 |
| EFFECT OF CURVATURE ON STRUCTURAL LOADING OF PRISMATIC BODIES SUBJECTED WATER SLAMMING | |
| DEVELOPMENT OF THE EXPERIMENTAL FACILITY FOR TESTING OF AERODYNAMIC SHAF | |
| CHARACTERISATION OF LAMINAR DAMAGE IN A COMPOSITE PANEL BY DIFFRACTION TOMOGRAPHY BASED IMAGING METHOD USING LAMB WAVES | 364 |
| IDENTIFICATION OF LAMB WAVES USING AN ENERGY-BASED TWO-TRANSDUCER METHO | |
| NUMERICAL STUDY OF NONLINEAR GUIDED WAVES IN LAMINATED COMPOSITE BEAMS WITH DELAMINATIONS | 379 |
| USE OF THE MODE-CONVERTED SCATTERED LAMB WAVES FOR BASELINE-FREE IMAGIN OF STRUCTURAL DAMAGE | |
| DEFORMATION OF PAVEMENT STRUCTURE DUE TO CONTACT EROSION FAILURE BELOW THE PAVEMENT LAYERS | |
| EARTH PRESSURE DEVELOPMENT IN INTEGRAL ABUTMENT BRIDGE SUBJECTED TO THERMAL LOADINGS | 408 |
| LOSS OF SUPER-HARMONIC RESONANCES IN A TIME-DELAYED NONLINEAR OSCILLATOR | |
| ANALYSIS OF SOIL-PIPELINE INTERACTION USING ABAQUS/EXPLICIT | 429 |
| VORTEX INDUCED VIBRATIONS OF SUBSEA PIPELINES | 440 |
| ON THE INCORPORATION OF DAMPING IN MODAL PARAMETER BASED SYSTEM IDENTIFICATION | 449 |
| CONDENSATION OF INDEPENDENT VARIABLES IN SOME EIGENVALUE PROBLEMS | 457 |
| EXACT SOLUTIONS TO THE FREE VIBRATION OF STEPPED BEAMS UNDER AXIAL LOAD \dots | 463 |
| PREDICTING PULL-OFF STRENGTHS OF BONDED JOINTS USING COHESIVE ELEMENTS \dots | 472 |
| APPLICATION OF FEA IN LARGE STORAGE TANKS' SHELL COURSE REPAIRS - A CASE STUDY ASSESSMENT TO DETERMINE MEMBRANE DEFORMATION AND STRUCTURAL STABILITY | 482 |
| MONITORING STRUCTURAL DAMAGE IN MATERIALS USING ADAPTIVE FINITE-IMPULSE-RESPONSE ANALYSIS AND THERMAL IMAGERY | 489 |
| DETERMINATION OF FM300 MATERIAL PROPERTIES USING LAMB WAVES | 500 |

| STRESS ANALYSIS OF BURIED PIPES | .510 |
|---|-------|
| CYCLIC DIRECT SIMPLE SHEAR TEST ON SOFT CLAY AT LOW NORMAL STRESS – AS APPLICABLE TO OFFSHORE PIPELINE AXIAL WALKING PROBLEMS | .519 |
| CODIFIED METHODS TO ANALYSE THE FAILURES OF WATER PIPELINES: A REVIEW | . 529 |
| ROOT CAUSE AND FATIGUE ANALYSIS OF TRACTION WINCH FAILURES | . 540 |
| EVALUATING THE USE OF STATISTICAL ESTIMATES OF VEHICLE GEOMETRIC AND INERT PROPERTIES FOR USE IN NUMERICAL SIMULATIONS | |
| CHALLENGES AND STRATEGIES IN TEACHING ENGINEERING MECHANICS | . 560 |
| COMPARISON OF DYNAMIC STIFFNESS AND FINITE ELEMENT METHODS IN DYNAMICS A AEROELASTIC RESPONSE | |
| A MAXIMUM STRESS AT A DISTANCE CRITERION FOR THE PREDICTION OF CRACK PROPAGATION IN ADHESIVELY-BONDED JOINTS | .574 |
| COMPARISON OF FAILURE CRITERION EXAMINING MATRIX DOMINANT FAILURE UNDER BIAXIAL LOADING | . 579 |
| INFLUENCE OF SPECIMEN SIZE ON FRACTURE TOUGHNESS OF SANDSTONE WHEN USII SCB SPECIMEN | |
| SEISMIC EARTH PRESSURE DEVELOPMENT IN SHEET PILE RETAINING WALLS: A NUMERICAL STUDY | .596 |
| VISCOUS CRITERION AND ITS RELATION WITH THE PROJECTILE-THORAX ENERGY INTERACTIONS | .604 |
| MEASUREMENT OF BIOMECHANICAL ENERGY DELIVERED THROUGH KICKING | .614 |
| MODELLING AND ANALYSIS OF VARIOUS PIEZO FIBRE GEOMETRIES ON THE | |
| PIEZOELECTRIC PROPERTIES FOR ENERGY SCAVENGING APPLICATIONS | |
| IN SITU CHARACTERIZATION OF THE FATIGUE CRACK-TIP STRESS FIELDS | |
| DETECTION OF LAMINAR DAMAGE IN COMPOSITE BEAMS USING NONLINEAR ULTRASON MODULATION TECHNIQUES | |
| NUMERICAL STUDY ON TRAFFIC INDUCED VIBRATION EFFECTS UNDER DIFFERENT TYPOF BEHAVIOUR OF MOVING LOADS | |
| VIBRATION-BASED DAMAGE DETECTION USING MODE SHAPE-BASED RESPONSE SURFAMETHODOLOGY | |
| DYNAMIC ANALYSIS OF MULTILAYER GFRP SANDWICH SLABS WITH INTERLAYER DELAMINATIONS | .660 |
| MECHANICAL RESPONSE OF A THICK COMPOSITE HYDROFOIL | .668 |
| ON THE CRITICALITY OF BONDLINE FLAW IN SCARF JOINTS UNDER IMPACT LOADING | .677 |
| FATIGUE RESISTANCE OF MECHANICALLY FASTENED, BONDED AND HYBRID JOINTS US IN COMPOSITE STRUCTURES | |
| A REDUCED BASIS SOFTWARE PLATFORM FOR STRUCTURAL DESIGN AND INFRASTRUCTURE ASSESSMENT | .693 |
| MODELLING ONSET OF FAILURE IN COMPOSITE STRUCTURES USING THE ENHANCED EMBEDDED ELEMENT TECHNIQUE | .701 |
| A DEPLOYABLE STENT FOR STRUCTURAL REPAIR OF WATER PIPES | .710 |
| NOVEL NON DESTRUCTIVE SAMPLE ANALYSIS TECHNIQUES USING NEUTRON SCATTER | |
| NUMERICAL ANALYSIS OF WELDING STRESSES IN WIC WELDABILITY TEST | .726 |
| A METHOD TO PREDICT STRIP CURVATURE UNDER ASYMMETRIC ROLLING CONDITIONS | 3734 |
| NUMERICAL MODELLING FOR IMPROVED UNDERGROUND-MINE VENTILATION SYSTEMS | 742 |

| PIEZOELECTRIC ENERGY HARVESTING UTILISING FLUTTER: AN OVERVIEW OF ANGLE, PROXIMITY AND TURBULENCE EFFECTS | 750 |
|--|-------|
| IMPACT FORCE RECONSTRUCTION ON A CONCRETE DECK USING A DECONVOLUTION APPROACH | 758 |
| A NEW GOVERNING EQUATION FOR DAMAGE DETECTION IN COMPOSITE LAMINATE BEAUTILISING MODAL ANALYSIS AND SCANNING LASER DOPPLER VIBROMETRY | |
| CHARACTERIZATION OF ENERGY ABSORPTION IN TAPERED THIN-WALLED S-RAILS | .775 |
| THE DEVELOPMENT OF STRESS IN INCLUSIONS CAUSED BY PLASTIC FLOW IN THE MAT OF A TWO-PHASE COMPOSITE AND ITS EFFECT ON THE RELIEF OF INITIAL RESIDUAL STRESS | |
| DESIGN AND ANALYSIS OF ENERGY ABSORBING CRASH BUFFERS FOR FIXED OBJECT IN HIGH SPEED ROADWAYS | |
| ON THE CRITICALITY OF BONDLINE FLAW IN SCARF JOINTS UNDER FATIGUE LOADING | . 799 |
| LINER STABILITY ANALYSIS FOR HDPE-LINED PIPE UNDER BENDING | .806 |
| COMPUTING THE FRICTION COEFFICIENT OF FRACTAL SURFACES USING SPOLY | 813 |
| A COMPARISON BETWEEN 1- AND 2-DEGREE OF FREEDOM ELECTROMAGNETIC ENERG HARVESTER FOR HEAVY HAUL RAILCAR APPLICATION | |
| ROTATIONAL ENERGY HARVESTING FROM A DRIVE SHAFT FOR STRUCTURAL HEALTH MONITORING | 829 |
| AN APPROACH TOWARDS A BASELINE-FREE TECHNIQUE FOR DAMAGE DETECTION UTILISING ADVANCES IN 3D LASER VIBROMETRY | 837 |
| AN INVESTIGATION ON THE CHIP FORMATION AND FORCES IN THE GRINDING OF INCONEL718 ALLOY USING THE SINGLE-GRAIN METHOD | 846 |
| EFFECT OF STATISTICAL SURFACE PARAMETERS ON THE INTERFACE TEMPERATURE ESTIMATION OF TWO SOLIDS IN CONTACT SLIDING | 854 |
| DEFLECTION OF THE BORE WRAP IN COILS | .862 |
| BENDING AND STABILITY OF FRAGMENTED BEAMS | .870 |
| NATURAL FIBER COMPOSITES WITH LOW THERMAL CONDUCTIVITY | .878 |
| HYBRID UNCERTAINTIES OPTIMIZATION USING THE ORTHOGONAL POLYNOMIALS EXPANSION | 883 |
| NEGATIVE STIFFNESS: IS THERMODYNAMICS DEFEATED? | .892 |
| PERFORMANCE CHARACTERIZATION OF SANDWICH COMPOSITE LAMINATES EMBEDDE WITH FIBER BRAGG GRATING SENSORS | |
| CRASHWORTHINESS DESIGN AND COMPARATIVE STUDIES OF SINGLE AND MULTI- LAYERED CORRUGATED SANDWICH STRUCTURES | 907 |
| ON THE MODIFIED OCTAGONAL RING BASED CUTTING FORCE MEASURING TRANSDUCE FOR IMPROVED SENSITIVITY | |
| ANALYTICAL PREDICTION OF STRAINS AND FORMING FORCES IN INCREMENTAL FORMI | |
| INVESTIGATION OF RESIDUAL STRESSES IN TITANIUM AEROSPACE COMPONENTS FORIVIA ADDITIVE MANUFACTURING | |
| COMPARING OF THE EFFECTS OF CVT AND DCT ON THE EVS INCLUDING BRAKING ENEI RECOVERY | |
| PREDICTION OF ELASTIC PROPERTIES OF POLYLACTIDE/HALLOYSITE COMPOSITES | .946 |
| OPTIMISATION OF COMPACTION FORCE FOR AUTOMATED FIBRE PLACEMENT | .952 |
| STRUCTURAL ANALYSIS OF A LOW WIND SPEED WIND TURBINE BLADE | .961 |

| ANISOTROPY EFFECT IN THE NANOSCRATCHING OF SILICON | .970 |
|---|------|
| THERMAL STRESS ANALYSIS OF HYDRAULIC HOSE IN MINING INDUSTRY | .976 |
| EFFECT OF WEAVE STRUCTURE ON FLAX FIBRES REINFORCED POLYPROPYLENE COMPOSITES IN STAMP FORMING | .985 |
| STAMP FORMING ANALYSIS OF A FIBRE METAL LAMINATE SYSTEM CONSISTING OF A GLASS FIBRE REINFORCED COMPOSITE | .993 |
| EVOLUTION OF MERIDIAN STRAINS IN STAMP FORMING OF STEEL-BASED FIBRE METAL LAMINATE | 1000 |
| A FINITE ELEMENT ANALYSIS OF FIBRE FRACTURE IN A POLYMER COMPOSITE DURING VIBRATION-ASSISTED CUTTING | 1008 |
| NUMERICAL SIMULATION OF BALLISTIC IMPACT ON WOVEN CFRP LAMINATE | 1016 |
| REVIEW OF ANTHROPOMORPHIC TEST DUMMIES FOR THE EVALUATION OF THORACIC TRAUMA DUE TO BLUNT BALLISTIC IMPACTS | 1025 |
| EVALUATION OF THE BLUNT THORACIC TRAUMA DUE TO BASEBALL IMPACTS – REVIEW THE BLUNT CRITERION | |
| AN ELASTIC PLASTIC FINITE ELEMENT CASE STUDY OF VOID PRESENCE UNDERNEATH TANK BOTTOM PLATE | |
| EXPERIMENTAL INVESTIGATION OF THIN METAL SHEETS UNDER TENSION-COMPRESSIC CYCLIC LOADING | |