ASIA PACIFIC

9th INTERNATIONAL MODERN SCIENCES CONGRESS

"Azerbaijan Cooperation University"

January 16-18, 2024/ Baku, Azerbaijan

EDITOR

Prof. Dr. Ömer DEPERLİOĞLU

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CONGRESS ID

CONGRESS TITLE

ASIA PASIFIC 9th INTERNATIONAL MODERN SCIENCES CONGRESS

DATE and PLACE

January 16-18, 2024/ Baku, Azerbaijan

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ASIA PACIFIC

9th INTERNATIONAL MODERN SCIENCES CONGRESS

"Azerbaijan Cooperation University"

January 16-18, 2024/ Baku, Azerbaijan

CONGRESS PROGRAM

ONLINE

Zoom Meeting ID: 833 4101 6484

Zoom Passcode: 161718

https://us02web.zoom.us/j/83341016484?pwd=VkZMbzYzTU4vaTBabExlMnBCelRxUT09

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DATE: 16.01.2024

BAKU LOCAL TIME: 10:30-11:00

ANKARA LOCAL TIME: 09:30-10:00

DELHI LOCAL TIME: 12:00-12:30

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ONLINE PRESENTATIONS

16.01.2024 / Session-1, Hall-1

BAKU LOCAL TIME	ANKARA LOCAL TIME
11 00 : 13 00	10 00 : 12 00

ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Keziban ORBAY

AUTHORS	AFFILIATION	TOPIC TITLE
Volkan SAYIN Keziban ORBAY	Amasya Provincial Directorate of National Education Amasya University	PEDAGOGICAL CONTENT KNOWLEDGE MODELS IN MATHEMATICS TEACHING: AN OVERVIEW
Muhammed Ömer EREN	Reşit Çifçi Dokuz Eylül Secondary School	INVESTIGATION OF VOCATIONAL HIGH SCHOOL STUDENTS' ATTITUDES TOWARDS PHYSICAL EDUCATION AND SPORTS COURSES IN TERMS OF DEMOGRAPHIC VARIABLES
Hülya ŞAHİN Recep Hakan ŞAHİN Özlem GÖKÇE TEKİN	İnönü University	MIDDLE SCHOOL STUDENTS' METAPHORICAL PERCEPTIONS OF ARTIFICIAL INTELLIGENCE
Volkan SAYIN Keziban ORBAY Emine ALTUNAY ŞAM Gönül Türkan DEMİR	Amasya Provincial Directorate of National Education Amasya University	GEOMETRY TEACHING IN THE CONTEXT OF THE BOOK "FIRST STEP IN GEOMETRY
Mehmet ATILGAN Faika ŞANAL KARAHAN	Uşak University	INVESTIGATION THE BULLYING LEVELS OF HIGH ACHIEVERS IN MATHEMATICS
Merve CİN Serpil ŞAHİN	Amasya University	SOLUTIONS OF SOME PARTIAL DIFERENTIAL EQUATIONS BY HOMOTOPY PERTURBATION METHOD
Serpil ŞAHİN Gizem POLAT	Amasya University	ABEL'S AND GENERALIZED ABEL'S INTEGRAL EQUATIONS
Nazile Abdullazade Bilal Hasanli	Azerbaijan State Pedaqoji University	USE OF INTERACTIVE METHODS AND WORK FORMS IN THE INTERPRETATION OF LITERARY WORKS

ONLINE PRESENTATIONS

16.01.2024 / Session-1, Hall-2

BAKU LOCAL TIME	ANKARA LOCAL TIME
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ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Vefalı ENSER

AUTHORS	AFFILIATION	TOPIC TITLE
Ebru CENGİZ	Istanbul Gelisim University	A FIELD STUDY ON TIME MANAGEMENT OF ASSOCIATE DEGREE STUDENTS DURING THE COVID-19 PERIOD
Kübra BAŞOL BAKİ Tansel SAPMAZ	Bezmialem Foundation University University of Health Sciences	THERAPEUTIC POTENTIALS OF CURCUMIN AND GALLIC ACID AGAINST THE EFFECTS OF OVARIAN TRANSPLANTATION IN THYMUS TISSUE
Özgür CENGİZ Okan ÖZBAKIR	Iğdır University	STATISTICAL EVALUATION IN FURNITURE MANUFACTURING SECTOR IN TERMS OF OCCUPATIONAL SAFETY AND OCCUPATIONAL DISEASES: ANALYSIS BETWEEN 2013-2022
Solmaz MOBARAKI	Van Yüzüncü Yıl University	ERUPTED DOUBLE MESIODENS WITH TAPERED TEETH APPEARANCE – CASE REPORT
Vefalı ENSER	Malatya Turgut Özal University	PREVENTION STUDIES of UNBALANCED INFORMATION FLOW PROBLEM
Tugay ARAT Selda ÖZGÜN	Akdeniz University Maltepe University	REVIEW OF ARTICLES ON SOCIAL MEDIA ADDICTION

ONLINE PRESENTATIONS

16.01.2024 / Session-1, Hall-3

BAKU LOCAL TIME	ANKARA LOCAL TIME
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ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Nurşen KULAKAÇ

AUTHORS	AFFILIATION	TOPIC TITLE
Sercan ERGÜN Kadir ÖNEM Deniz BAYÇELEBİ Ümmet ABUR Özlem TERZİ Senanur OLFAZ ASLAN Neslihan TAŞKURT HEKİM Sezgin GÜNEŞ Dilbeste DEMİR Yeda KELEŞ	Ondokuz Mayıs University	INVESTIGATION OF THE ASSOCIATION OF TRNA-DERIVED FRAGMENTS (TRF-18-79MP9P04 AND TRF-17-79MP9PP) WITH PROSTATE CANCER
Sercan ERGÜN Ferda ARI Erdal BENLİ Diler US ALTAY Tevfik NOYAN Havva ERDEM Yeliz KAŞKO ARICI	Ondokuz Mayıs University Uludag University Ordu University	THE RELATIONSHIP OF EXOSOMAL TR-KIT AND ITS POTENTIAL TRANSCRIPTION FACTOR, YY1, WITH PROSTATE CANCER
Fatih YILMAZ	Mardin Training and Research Hospital	EXTRACRANIAL SCHWANNOMA; ASSESSMENT OF HISTOLOGICAL FEATURES ACCORDING TO LOCALIZATION
Eda Duygu İPEK Ayşe Gizem ŞAHMELİKOĞLU	Aydin Adnan Menderes University	APERTURA PIRIFORMIS AND OS NASALE TYPES, A MORPHOMETRIC STUDY
Rəna Rüfət qızı Rəhimova	Azerbaijan Medical University	CHARACTERISTICS OF GENETIC POLYMORPHISMS IN AZERBAIJAN PATIENTS WITH AUTOIMMUNE THYROIDITIS
Sema KOÇAN Nurşen KULAKAÇ	Recep Tayyip Erdogan University Gumushane University	PRACTICES OF SURGICAL INTENSIVE CARE NURSES TO PREVENT PRESSURE INJURIES: A QUALITATIVE STUDY
Nurşen KULAKAÇ Sema KOÇAN	Gumushane University Recep Tayyip Erdogan University	ROLE OF PERIOPERATIVE NURSING IN ROBOTIC SURGERY

ONLINE PRESENTATIONS

16.01.2024 / Session-1, Hall-4

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HEAD OF SESSION: Mahmood AHMED

AUTHORS	AFFILIATION	TOPIC TITLE
Mahmood AHMED	University of Education	NAPROXEN CONJUGATED SULFONAMIDES AS UREASE INHIBITORS
Khadija ZAKI Fatimazahra FAKIR Abdelouahid SBAI Hamid MAGHAT Mohammed BOUACHRINE Tahar LAKHLIFI	Moulay Ismail University	INHIBITION ACTIVITY OF TRIAZOLES AS A NEW FAMILY FOR THE INHIBITION OF THE INDOLEAMINE 2,3-DIOXYGENASE 1 IDO1 PROTEIN USING 2D-QSAR APPROACH
Arooj ANWAR Fozia ANJUM Muhammad SHAHID Samreen Gul KHAN	Government College University	PREPARATION OF HEALING AGENT FROM MURRAYA KOENGII TO TREAT BURN INFECTION
Mohammed ELHOURRI Zakya M'HAMDI Mostafa ETTARCHOUCH Mohamed SABRI Ali AMECHROUQ	Moulay Ismail University	COMPOSITION OF THE ESSENTIAL OIL OF THE LEAVES OF ARTEMISIA HERBA ALBA ASSO (ASTERACEAE) AND ITS INSECTICIDAL ACTIVITY ON CALLOSOBRUCHUS MACULATUS FABRICIUS (COLEOPTERA: BRUCHIDAE)
J. YESHWANTH S. KALAIVANAN R. DEVI R. JOTHI LAKSHMI Dr. R. SRINIVASAN	Bharath Institute	A SHORT REVIEW ON THE SILVER NANOPARTICLES AMS THEIR APPLICATIONS IN PHARMACY
L.DIANA R. DEVI R. SRINIVASAN	Bharath Institute	GOLD NANOPARTICLES IN BIOLOGY AND MEDICINE: RECENT ADVANCES AND PROSPECTS
Mekhalef BENHAFSA LEILA Azzaz YAHIA	University of DjillaliLiabes	EXPLORATION OF THE STRUCTURAL, ELECTRONIC AND OPTICAL PROPERTIES OF GE-HALIDE PEROVSKITES : A DFT STUDY

ONLINE PRESENTATIONS

16.01.2024 / Session-2, Hall-1

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HEAD OF SESSION: Baya MARAF

AUTHORS	AFFILIATION	TOPIC TITLE
Engin Evrim ÖNEM	Erciyes University	VOWEL HARMONY and THE INTERROGATIVE CLITIC mI in TURKISH
Baya MARAF Warith Adnan DHIYAB AL-RUBAIAI	1University of Technology and Applied Sciences	Challenges of the Implementation of New Reforms and Policies for Academic and Administrative Staff in a State University in Oman
Jonida BUSHI Ema KRISTO	University of Tirana	HARMONIZING TECHNOLOGY AND LANGUAGE: THE INNOVATIVE ROLE OF PODCASTS IN GERMAN LANGUAGE LEARNING IN ALBANIA
Zohaib Hassan SAIN	Superior University	ASSESSING THE EFFICACY OF PLAGIARISM DETECTION SOFTWARE AS AN EDUCATIONAL RESOURCE IN ACADEMIC WRITING INSTRUCTION
Zohaib Hassan SAIN	Superior University	AI-POWERED LEARNING REVOLUTION: UNLEASHING EDUCATIONAL TRANSFORMATION
Thi-Hoang-Anh TRAN Vo-Tuan-ANH	Can Tho University	FACTORS INFLUENCING CREATIVITY AMONG VIETNAMESE STUDIES STUDENTS AT CAN THO UNIVERSITY, CAN THO CITY, VIETNAM
Huynh-Nhu THI TU Que-Nhu DUONG Nam-Khang Tri NGUYEN	Can Tho University	THE UNDERSTANDING OF CHATBOT - THE CASE OF VIETNAMESE TOURISTS
Moses Adeolu AGOI Oluwakemi Racheal OSHINOWO Solomon Abraham UKPANAH Oluwanifemi Opeyemi AGOI	Lagos State University	THE EFFICACY, USE AND ROLE OF DIGITAL LIBRARY (DL): AN EXPLICIT SURVEY ON EDUCATIONAL DEVELOPMENT
Rakesh RANJAN Mohammad JAVED ALAM	Presidency University Bengaluru	AN EFFICIENT EXPONENTIAL FITTED SPLINE NUMERICAL METHOD TO THE SOLUTION OF SINGULARLY PERTURBED DIFFERENTIAL DIFFERENCE EQUATIONS HAVING SMALL DELAYS
Nandan SHARMA Poonam PANT Rishita TRIPATHI	Sharda University	EMERGENCE OF NEW PRINCIPLES OF ROAD SAFETY

ONLINE PRESENTATIONS

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Nathenael FENTAW AYELE	Wollo University	IS IMPLEMENTATION OF BALANCED SCORECARD AND PERFORMANCE OF FINANCIAL INSTITUTION IN ETHIOPIA
Ephraim AUGUSTINE MINA Sanni ABUBAKAR	Federal Polytechnic Ekowe	ASSESSING THE IMPACT OF TRAINING AND DEVELOPMENT ON PERFORMANCE OF EMPLOYEES IN NIGERIA PUBLIC SECTOR
Farkhan HUZEIN Hendri Hermawan ADİNUGRAHA	UIN K.H. Abdurrahman Wahid Pekalongan	MUSLIM WOMEN ARE REQUIRED TO COVER THEIR PRIVATE PARTS: A LITERATURE REVIEW
C.VIJAI M. RAJENDRAN M.ELAYARAJA	St.Peter's Institute of Higher Education and Research	ARTIFICIAL INTELLIGENCE IN E-COMMERCE
Agim BERISHA	College of Business	THE LABOR MARKET AND UNEMPLOYMENT RATE IN KOSOVO
Olena BUDIAKOVA	Kyiv National University	DEVELOPING BIOECONOMY IN THE CONTEXT OF MIGRATION PROCESSES
Ihor PONOMARENKO Olena BONDARENKO	State University of Trade and Economics	AI-DRIVEN DIGITAL MARKETING FOR SMART CITIES
Pérez Gamón Carolina MARGARITA	Universidad del Nordeste- Facultad de Humanidades	LATIN AMERICA, DESPITE HAVING A PRIVILEGED LOCATION IN TERMS OF ITS NATURAL RESOURCES, SEEKS TO OVERCOME ECONOMIC PROBLEMS
Lawal, AMIRU BALARABE	Federal University	NIGERIAN HOUSEHOLD SAVINGS BEHAVIOR: A CONCEPTUAL STUDY
Priya J	Deemed to be University	THE ART OF DESIGN THINKING

ONLINE PRESENTATIONS

16.01.2024 / Session-2, Hall-3

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ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Elif ULU

AUTHORS	AFFILIATION	TOPIC TITLE
Elif DOGANAY Elif ULU	Ege University	A REVIEW OF THE LITERATURE: LGBTI+'S EXPERIENCES OF SOCIAL EXCLUSION
Hacer YILDIRIM KURTULUŞ	M.E.B	INVESTIGATION OF THE RELATIONSHIP BETWEEN SELF-COMPASSION AND PSYCHOLOGICAL DISTRESS IN ADOLESCENTS
Hacer YILDIRIM KURTULUŞ	M.E.B	INVESTIGATION OF DEATH ANXIETY IN EMERGING ADULTHOOD IN TERMS OF DEMOGRAPHIC VARIABLES
Senay TOPTANIŞ	Nişantaşı University	THE RELATIONSHIP BETWEEN AND ANXIETY LEVELS OF REFUGEE/ASYLUM SEKEER AID WORKERS AND SECONDARY TRAUMATIC STRESS LEVELS FROM THE PERSPECTIVE OF SOME VERIABLES
Rümeysa AKPINAR Şüheda ATLI Yeliz KINDAP TEPE	Ondokuz Mayıs University	INVESTIGATION OF HELICOPTER PARENTING AS PERCEIVED BY PARENTS AMONG UNIVERSITY STUDENTS
Amine Bükre KİHTİR Yeliz KINDAP TEPE	Trabzon University Ondokuz Mayıs University	DEVELOPMENT OF THE SHORT VERSION OF THE BASIC PSYCHOLOGICAL NEED SATISFACTION AND FRUSTRATION SCALE-CHILD FORM
Ausaf Ahmed FAROOQUI Hasan DUYMUŞ Şehmus KURT Emrah ÇELTIKÇI	İhsan Doğramacı Bilkent University Yıldırım Beyazıt University Gazi University	CAUSAL ROLE OF THE RIGHT-INFERIOR FRONTAL REGION IN 3D OBJECT IDENTIFICATION
Ercan YAVUZ Edanur VARİLCİ	Ankara Hacı Bayram Veli University	A RESEARCH ON POSITIVE DISCRIMINATION TOWARDS WOMEN'S WORKING LIFE IN TURKIYE IN AND AFTER 2000 WITHIN THE FRAMEWORK OF STRATEGIC HUMAN RESOURCES MANAGEMENT APPROACH
Kemal GÖZ	Bilecik Şeyh Edebali University	THE VIRTUE THAT HUMANITY NEEDS: FREEDOM TO LIVE

ONLINE PRESENTATIONS

16.01.2024 / Session-2, Hall-4

BAKU LOCAL TIME	ANKARA LOCAL TIME
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HEAD OF SESSION: Levend COŞKUNTUNA

AUTHORS	AFFILIATION	TOPIC TITLE
Ender UZABACI	Bursa Uludag University	INVESTIGATION OF GRAPHIC TYPES USED IN POSTGRADUATE STUDIES IN THE FIELD OF VETERINARY SCIENCES AND THEIR COMPLIANCE WITH DATA STRUCTURE
Levend COŞKUNTUNA	Tekirdağ Namık Kemal University	MAIZE SILAGE IN DAIRY FARMING
Levend COŞKUNTUNA	Tekirdağ Namık Kemal University	THE PLACE OF CONCENTRATED FEEDS IN DAIRY CATTLE NUTRITION
Məmmədov Sabir Rüstəm oğlu Cəfərov Fazil Tatarxan oğlu	ADPU	Great Leader HAYDER ALIYEV AND IN AZERBAIJAN DEVELOPMENT OF AGRICULTURE
Cəfərov Fazil Tatarxan oğlu Məmmədov Sabir Rüstəm oğlu	ADPU	ENVIRONMENTAL POLLUTION AND ITS SOCIO-ECONOMIC EFFECTS
Aybegüm GÜNGÖRDÜ BELBAĞ Sedat BELBAĞ	Bartin University Ankara Hacı Bayram Veli University	QUANTITATIVE STUDY ON THE INTENTION TO PURCHASE REMANUFACTURED PRODUCTS

ONLINE PRESENTATIONS

16.01.2024 / Session-3, Hall-1

BAKU LOCAL TIME	ANKARA LOCAL TIME
16 00 : 18 00	15 00 : 17 00

ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Ömer DEPERLİOĞLU

AUTHORS	AFFILIATION	TOPIC TITLE
Ömer DEPERLİOĞLU	Afyon Kocatepe University	BLOCKCHAIN TECHNOLOGY APPLICATIONS IN HEALTH SYSTEMS: BENEFITS, CHALLENGES
Ömer DEPERLİOĞLU	Afyon Kocatepe University	BLOCKCHAIN APPLICATIONS IN MEDICAL DATA MANAGEMENT: REQUIREMENTS, APPLICATION POTENTIAL AND CHALLENGES THAT MAY BE ENCOUNTERED
İsrafil TAŞCI Abdurrahman GÜNDAY Güneş YILMAZ	Bursa Uludağ University	THEORETICAL INVESTIGATION OF THE EFFECTS OF ALUMINIUM COMPOSITION PARAMETER ON THE EMISSION PERFORMANCE OF IR LEDS
Olcay ÖLÇEN Selçuk GÜN	Nişantaşı University Social Security Institution	AN ENVIRONMENTAL VISION IN AVIATION: ICAO ANNEX 16
Hikmet ÇİÇEK Semih DURAN İsmail Hakkı KORKMAZ İhsan EFEOĞLU	Erzurum Technical University Kafkas University Atatürk University	DESIGN AND PRODUCTION OF MULTILAYER TiNi/MAX THIN FILMS
Fahri MURAT Osman YAVUZ İsmail Hakkı KORKMAZ İrfan KAYMAZ Ümit ERTAŞ	Erzurum Technical University Atatürk University	PATIENT SPECIFIC RECONSTRUCTION PLATE DESIGN AND MANUFACTURING WITH SELECTIVE LASER MELTING METHOD
Betül UYSAL Hüseyin YILDIZ Erol UZAL Birkan DURAK Ali Serdar GÜLTEK Mana SEZDİ Şile KAPKIN Serdar YILMAZ	Istanbul University-Cerrahpaşa	ANALYTICAL SOLUTION OF FREE VIBRATION PROBLEM FOR AN AXISYMMETRIC CYLINDER
Emine SARIALİOĞLU Şinasi Kaya	Istanbul Technical University	DETERMINATION OF HEAVY DAMAGED AREAS AFTER EARTHQUAKE WITH DEEP LEARNING METHOD: A CASE STUDY OF KAHRAMANMARAS
Abdo Akmel AGANE Osman AYTEKİN Hakan KUŞAN	Eskisehir Osmangazi University	AN APPLICATION OF BURGESS METHOD FOR BALANCING LABOR RESOURCES IN TIME CONSTRAINED CONSTRUCTION PROJECTS

ONLINE PRESENTATIONS

16.01.2024 / Session-3, Hall-2

BAKU LOCAL TIME	ANKARA LOCAL TIME
16 00 : 18 00	15 00 : 17 00

ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Sanae ZRIOUEL

AUTHORS	AFFILIATION	TOPIC TITLE
Seçil DEMİRKOL CANLI	Hacettepe University	IDENTIFICATION OF THE EPIGENETIC-TRANSCRIPTOMIC CHANGES RELATED TO CLINICAL OUTCOME IN PANCREATIC CANCER
Sanae ZRIOUEL	CADI AYYAD University	MAGNETIC NANOMATERIAL-BASED HYPERTHERMIA FOR CANCER TREATMENT
Gulara HASANOVA	---	OUR BODY'S REACTION TO WHAT WE DO
R.THIRUCHELVI P.SARAVANAN M.CHAMUNDEESWARI	St. Josephs College of Engineering	RESEARCH PROGRESS OF NANOCELLULOSE-BASED FOOD PACKAGING
Arjeta VESHI Silva IBRAHIMI Ervin IBRAHIMI Giorgia MAZZARINI	University of Albania	THE ECO-PSYCHOSOCIAL APPROACH TO WELL-BEING CONCERNING CLIMATE CHANGE AND EXTREME NATURAL PHENOMENA
Muhammad HASEEB AHMAD	University Faisalabad	MONITORING OF FOOD ADULTERATION IN SPICES USING SPECTROSCOPIC TECHNIQUES

ONLINE PRESENTATIONS

16.01.2024 / Session-3, Hall-3

BAKU LOCAL TIME	ANKARA LOCAL TIME
16 00 : 18 00	15 00 : 17 00

ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Neslihan BALCI

AUTHORS	AFFILIATION	TOPIC TITLE
Nimet ÖZMERAL Semra AVŞAR Ulku SOYDAL Suheyla KOCAMAN Gulnare AHMETLI	Konya Technical University Selcuk University	INVESTIGATION OF DIFFERENT APPLICATION AREAS OF WASTE PEACH KERNEL SHELLS
Nijat MUSAYEV Gulnare AHMETLİ	Konya Technical University	USING THE PYROLYSIS PRODUCT OF WASTE TIRES-CARBON BLACK AS A FILLER IN HYBRID COMPOSITES
Serap KAYİŞOĞLU	Namık Kemal University	A RESEARCH ON DETERMINING MOLASSES CONSUMPTION LEVEL IN TEKIRDAĞ PROVINCE
Nesrin COLAK Leyla YILMAZ	Karadeniz Technical University	THE EFFECT OF PRE-N-ACETYL CYSTEINE TREATMENTS ON INCREASING SALT STRESS TOLERANCE IN MAIZE (ZEA MAYS L.) SEEDS
Cansel CANDAN Ülkü SOYDAL	Selcuk University	INVESTIGATION OF THE PROPERTIES OF AVOCADO SEED ADDED STARCH FILMS
Merve KESEN Ülkü SOYDAL	Selcuk University	INVESTIGATION OF THE PROPERTIES OF MARJORAM OIL ADDED POLYMER FILMS

ONLINE PRESENTATIONS

16.01.2024 / Session-3, Hall-4

BAKU LOCAL TIME	ANKARA LOCAL TIME
16 00 : 18 00	15 00 : 17 00

ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Major Gheorghe GIURGIU

AUTHORS	AFFILIATION	TOPIC TITLE
Parisa SHAVALI-GILANI Alireza BAKHTIYARI Parisa SADIGHARA Saeed AGHEBATBEKHEIR	Tehran University of Medical Sciences	DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN ROASTED SUNFLOWER SEED
Major Gheorghe GIURGIU Manole COJOCARU Georgeta SINIȚCHI	Deniplant-Aide Sante Medical Center	THE INFLUENCE OF PLANTS ON THE MICROBIOME IN PATIENTS WITH AUTOIMMUNE DISEASES
Delbrin AHMED	University of Duhok	COMBINATORIAL INSIGHTS INTO SEMILATTICE STRUCTURES: COUNTING SUBUNIVERSES, CONGRUENCES, AND WEAK CONGRUENCES VIA TREE DEFINITIONS
Laila EL ARCHI Fatih YIGIT	Altinbas University	CONTRIBUTION TO THE IMPLEMENTATION OF THE HACCP SYSTEM WITHIN THE ORANGE NECTAR WORKSHOP
Stanislava STATEVA	Agricultural Academy	DEVELOPMENT OF METHODS AND TECHNOLOGIES FOR IN VITRO PROPAGATION AND STORAGE OF HELICHRYSUM ITALICUM L.
Hassane ABD-DADA Said BOUDA Abdelmajid HADDIOUI	Sultan Moulay Slimane University	ARE THE POPULATION STRUCTURING OF MEDICINAL PLANT (EUPHORBIA RESINIFERA) FOLLOWS A MODEL OF ISOLATION BY GEOGRAPHICAL DISTANCE?
Sababa FATIMA İsmail BAYRAM	Afyon Kocatepe University	EFFECTS OF ORGANIC ZINC SUPPLEMENTATION ON DAIRY CALVES' HEALTH AND PERFORMANCE
Sababa FATIMA İsmail BAYRAM	Afyon Kocatepe University	IMPACT OF SUPPLEMENTARY ORGANIC CHROMIUM ON THE WELL BEING OF DAIRY CALF
TAYOU Soukaina SELMAOUI Karima OUAZZANI TOUHAMI Amina El MODAFAR Cherkaoui DOUIRA Allal	Ibn Tofail University	REVIEW OF THE ESCA DISEASE IN VINES
Bankole MUSTAPHA OLATUNJI	Federal University Lokoja	APPLICATION OF EUCLIDEAN ALGORITHM IN FINDING INVERSE OF Z_p

ONLINE PRESENTATIONS

17.01.2024 / Session-1, Hall-1

BAKU LOCAL TIME	ANKARA LOCAL TIME
11 00 : 13 00	10 00 : 12 00

ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Osman MUTLUEL

AUTHORS	AFFILIATION	TOPIC TITLE
Esra YILDIZ	Yalova University	FORENSIC MEDICINE REPORTS IN SIJILLÂT AL-SHAR'IYYAH AS A SOURCE FOR THE HISTORY OF OTTOMAN MEDICINE
Osman MUTLUEL	Pamukkale University	AN EVALUATION ON IBN MUKAFFA'S UNDERSTANDING OF POLITICS
Tuğba UZUN GEDİKLİ Abdullah AYAYDIN	Trabzon University	THE CONCEPT OF TALENT AND SKILL IN VISUAL ARTS EDUCATION
Tuğba UZUN GEDİKLİ	Trabzon University	MARCEL DUCHAMP CONCEPT AND BEYOND
AKCAN Nurettin	M.E.B	"PERCEPTION OF EVIL" OF REVELATION-BASED RELIGIONS IN THE CONTEXT OF THE HOLY BIBLE
AKCAN Nurettin	M.E.B	THE VIEW OF DUALIST RELIGIONS ON THE "PHENOMENON OF EVIL"

ONLINE PRESENTATIONS

17.01.2024 / Session-1, Hall-2

BAKU LOCAL TIME	ANKARA LOCAL TIME
11 00 : 13 00	10 00 : 12 00

ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Muhammad FAISAL

AUTHORS	AFFILIATION	TOPIC TITLE
Faisal ZULHUMADI Muhammad Nur AZMI MOHD NASRI	Universiti Utara Malaysia	CYBERSECURITY AWARENESS AMONG MALE AND FEMALE MALAYSIAN TERTIARY STUDENTS: EVİDENCE FROM A NORTHERN UNIVERSITY
Nur Adlin AISYAH BINTI DAINURI Che Nur Qhairawani NADHIRAH BINTI CHE AMRAN Najwa SYAHIRAH BINTI BAHRUM	Universiti Utara Malaysia	EXPLORING ENVIRONMENTAL, SOCIAL, AND GOVERNANCE (ESG) INITIATIVES AND STRATEGY IN LOGISTICS AND TRANSPORTATION COMPANIES TOWARDS LOWER CARBON INDUSTRY
Kamaruddin RADZUAN Lim CHIN YI	Universiti Utara Malaysia	THE IMPACT OF ON-THE- JOB TRAINING AND OFF-THE-JOB TRAINING ON EMPLOYEE PERFORMANCE
Lee ZI QING Mohd Kamarul IRWAN ABDUL RAHIM	Universiti Utara Malaysia	FACTORS INFLUENCING THE INTENTION TO USE SELF-SERVICE KIOSK AMONG CONSUMERS IN KEDAH MALAYSIA
Ooi MEI TING Mohd Kamarul IRWAN ABDUL RAHIM	Universiti Utara Malaysia	FACTORS THAT INFLUENCE EMPLOYEES' ACCEPTANCE OF USING E-LEARNING SYSTEMS
Volodymyr MESHCHERIAKOV Liubov KRAINIA	State Biotechnological University	ANALYSIS OF THE FORMATION, DISTRIBUTION AND USE OF PROFIT AT THE ENTERPRISE
Wildan NAUFAL ZUHDI Ade Irma ANGGRAENI	Universitas Jenderal Soedirman	MANAGING HUMAN RESOURCES IN NATURE TOURISM: QUALITATIVE APPROACH
Norsurianna TEH BINTI ABDULLAH INAYAH YAAKUB Abu Bakar ABDUL HAMID	Infrastructure University Kuala Lumpur	THE EFFECTS OF CORPORATE GOVERNANCE MECHANISMS ON FIRM FINANCIAL PERFORMANCE OF PUBLIC LISTED COMPANIES IN MALAYSIA USING DUPONT ANALYSIS
Muhammad FAISAL Alquma NOOR	Allama Iqbal Open University	PAKISTAN'S ECONOMY IS ASSESSED TO HAVE CONTRACTED IN FY23, FOLLOWING TWO CONTINUOUS LONG STRETCHES OF HEAVENLY DEVELOPMENT. HOW PAKISTAN CAN MANAGE
M.K.GANESHAN	Alagappa University	NAVIGATING THE FUTURE: ASSESSING THE TRANSFORMATIVE IMPACT OF INDUSTRY 5.0 ON HUMAN RESOURCE MANAGEMENT PRACTICES

ONLINE PRESENTATIONS

17.01.2024 / Session-1, Hall-3

BAKU LOCAL TIME	ANKARA LOCAL TIME
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ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Siarhei MAROZAU

AUTHORS	AFFILIATION	TOPIC TITLE
Siarhei MAROZAU	---	"SMORGON BEAR ACADEMY" AS A BELARUSIAN HISTORICAL BRAND
Sándor FÖLDVÁRI	Debrecen University	THE ANCIENT 'MEDIA ATROPATENE' AND 'ALBANIA': THEIR ROLE IN THE HISTORY OF THE CAUCASUS REGION
Muhammad IRSYAD Yusma INDAH JAYADI	IPB University	SYSTEMATIC REVIEW OF STATE PROPERTY VALUATION AT THE INDONESIAN STATE WEALTH AND AUCTION SERVICE OFFICE: CHALLENGES AND SUCCESSES
Dr. Maria Pia ESTER CRISTALDI Dr. Angelo Francesco CARLUCCI	Üsküdar University	THE ROLE OF ONLINE PRESS IN THE CONSTRUCTION OF THE UYGHUR IDENTITY AND COLLECTIVE MEMORY
Favour C. UROKO	University of Nigeria	JEREMIAH 6:13–16 AND THE PROPHETIC MINISTRY IN NIGERIA
Dahiru, A. RN Saminu ALHAJI INUWA Badamasi LAWAL	Lincoln University	THE MENACE OF POVERTY AMONG GIRL CHILD IN KANO STATE NIGERIA: UBE AS SOLUTION
Asif Ahmad BHAT	Jamia Millia Islamia	CASTE INDUCED SOCIAL PRACTICE: THE PLIGHT AND EVOLUTION OF WATALS IN KASHMIR
OLUBANJO-OLUFOWOBI, Olufunso	Mountain Top University	IS ARCHITECTURE ART: AN EXPLORATIVE STUDY OF THE RELATIONSHIP BETWEEN PHILOSOPHY OF ART AND ART

ONLINE PRESENTATIONS

17.01.2024 / Session-1, Hall-4

BAKU LOCAL TIME	ANKARA LOCAL TIME
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ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: Vinod KUMAR

AUTHORS	AFFILIATION	TOPIC TITLE
Hassan ALIYU Abdulrashid ABUBAKAR GARBA Mustapha ALIYU	Sokoto State University	CHEMISTRY TEACHERS' JUDGEMENTS ON LEARNING ABSTRACT SUBMACROSCOPIC CHEMICAL PROCESSES VIRTUALLY THROUGH PHET INTERACTIVE SIMULATION
Gökhan ÇAYLI	Istanbul Univesity-Cerrahpaşa	ATRP POLYMERIZATION OF EPOXIDIZED OLEYL ACRYLATE (EOA)
Gökhan ÇAYLI	Istanbul Univesity-Cerrahpaşa	FTIR CHARACTERIZATION OF BIOBASED ISOCYANATES
Mohd Azam MOHD ADNAN Mohd Rafie JOHAN Nurhidayatullaili MUHD JULKAPLI	Universiti Malaya	PHOTO MITIGATION OF PHENOLIC SYNTHETIC DYES BY CATALYTIC OXIDATION PROCESS OF ZNO/TIO2-CHITOSAN UNDER SOLAR IRRADIATION
Vinod KUMAR Neha PATHAK Sasin KUMAR	G D Goenka University	A HOLISTIC ANALYSIS OF SUN PROTECTION FACTOR AND ITS RELEVANCE IN SUNSCREEN EFFICIENCY
R. SUNDARAJAN R. JOTHILAKSHMI S.G. RAMAN	Mohamed Sathak AJ College	NANOPARTICLE-MEDIATED HERBAL MEDICINE FORMULATIONS
Z. RAHOU D. MOUSTAINE Y. BEN-ALI A. HALLAOUI	Sidi Mohamed Ben Abdellah University	THERMODYNAMIC OPTIMIZATION OF Gd–Ni BINARY SYSTEM SUPPORTED BY DFT CALCULATIONS

ONLINE PRESENTATIONS

17.01.2024 / Session-1, Hall-5

BAKU LOCAL TIME	ANKARA LOCAL TIME
11 00 : 13 00	10 00 : 12 00

ZOOM ID: 833 4101 6484 | **ZOOM PASSCODE: 161718**

HEAD OF SESSION: K.R.PADMA

AUTHORS	AFFILIATION	TOPIC TITLE
M. RADHA M. SESHADRI M.J.V. BELL V. ANJOS	Koneru Lakshmaiah Education Foundation	STRUCTURAL AND ENHANCED PHOTO EMISSION STUDY OF FIBER LASER AMPLIFIER
Marija RADMILOVIĆ-RADJENOVIĆ Branislav RADJENOVIĆ Nikola BOŠKOVIĆ	University of Belgrade	PHYSICS-BASED STUDIES OF SURGICAL ELECTRODE DESIGN TO PREVENT SPARKING ENHANCED SKIN BURNS DURING ELECTROCAUTERY
D.SAADAOUI M. ELYAQOUTI I. CHOULLI S. LIDAIGHBI	Agadir Ibn Zohr University	OPTIMIZING PHOTOVOLTAIC MODELS THROUGH GENETIC ALGORITHM: PRECISION AND RELIABILITY IN PARAMETER EXTRACTION
Mamoun Lyes HENNACHE Ali HENNACHE	King Fahad University	CL0SING THE GAP IN SAUDI ARABIA BETWEEN ELECTRICAL ENGINEERING EDUCATION AND INDUSTRY 4: A CHOICE OR NECESSITY
Assala MARIR Mounia GUERGOURI Rafik BENSEGUENI Abdelmadjid KHERROUBA Ammar KHELIFA BAGHDOUCHE	Université des Frères Mentouri	ELECTROPOLYMERIZATION OF TWO SALICYL-BASED MONOMERS
Imoh Ime EKANEM Aniekan ESSIENUBONG IKPE	Akwa Ibom State Polytechnic	A BROAD PERSPECTIVE OF ARTIFICIAL LIFTING MECHANISMS IN THE OIL AND GAS INDUSTRY: OPERATIONAL PANACEA TO ENHANCED OIL RECOVERY
K.R.PADMA K.R.DON	Bharath University	INTRODUCTION OF ARTIFICIAL INTELLIGENCE IN LIFE SCIENCES: UNLOCKING NEW POTENTIALS-A REVIEW UPDATE
Chayaraju BALASAI Nadagouda KALYANI	G. Pulla Reddy Engineering College	COW DUNG EFFECT ON CONCRETE
Nadagouda KALYANI Chayaraju BALASAI	G. Pulla Reddy Engineering College	PLASTICWASTE AS COARSE AGGREGATE IN CONCRETE
Yusuf Babangida ATTAHIRU Azman MOHAMED Raimi MOHD RAMLI K. PARAMESVARAN	Universiti Teknologi Malaysia	APPLICATION OF ZYCOTHERM-SP2 ON WARM MIX ASPHALT CONCRETE: A CONTEMPORARY TECHNOLOGY

PHOTO GALLERY



ASIA PASIFIC 9th INTERNATIONAL MODERN SCIENCES CONGRESS
January 16-18, 2024/ Baku, Azerbaijan
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Zoom Toplantı
Kaydediliyor...
Giriş yapın
Kalan: 09:43:13
Observer Hall-3
S-2/H-3, Elif DOĞANAY
Observer Hall-3
Doç.Dr. Elif Ulu
s-2/h-3/Şehmus Kurt
Kemal Göz
Şüheda Atlı
Senay Toptanış
Amine Bükre Kihtir
HALL-3, EDANUR VARİLCİ
Katılımcılar (9)
Katılımcı bul
O... (Ortak oturum sahibi, ben)
Doç.Dr. Elif Ulu
Senay Toptanış
Amine Bükre Kihtir
HALL-3, EDANUR VARİLCİ
Kemal Göz
S-2/H-3, Elif DOĞANAY
s-2/h-3/Şehmus Kurt
Şüheda Atlı
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TUR
12:38
16.01.2024


Zoom Toplantı
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Kalan: 09:58:26
Observer Hall-3
S-1, H-3 Sercan ERGÜN
Observer Hall-3
S1 H3 Nurşen KULAKAÇ (DİJİTAL KANATLAR)
Fatih YILMAZ, Session-1, Hall-3
S-2, H-3, Elif DOĞANAY
S1 H3 Sema KOÇAN
Katılımcılar (6)
Obse... (Ortak oturum sahibi, ben)
Fatih YILMAZ, Session-1, Hall-3
S1 H3 Nurşen KULAKAÇ (DİJİTAL...
S1 H3 Sema KOÇAN
S-1, H-3 Sercan ERGÜN
S-2, H-3, Elif DOĞANAY
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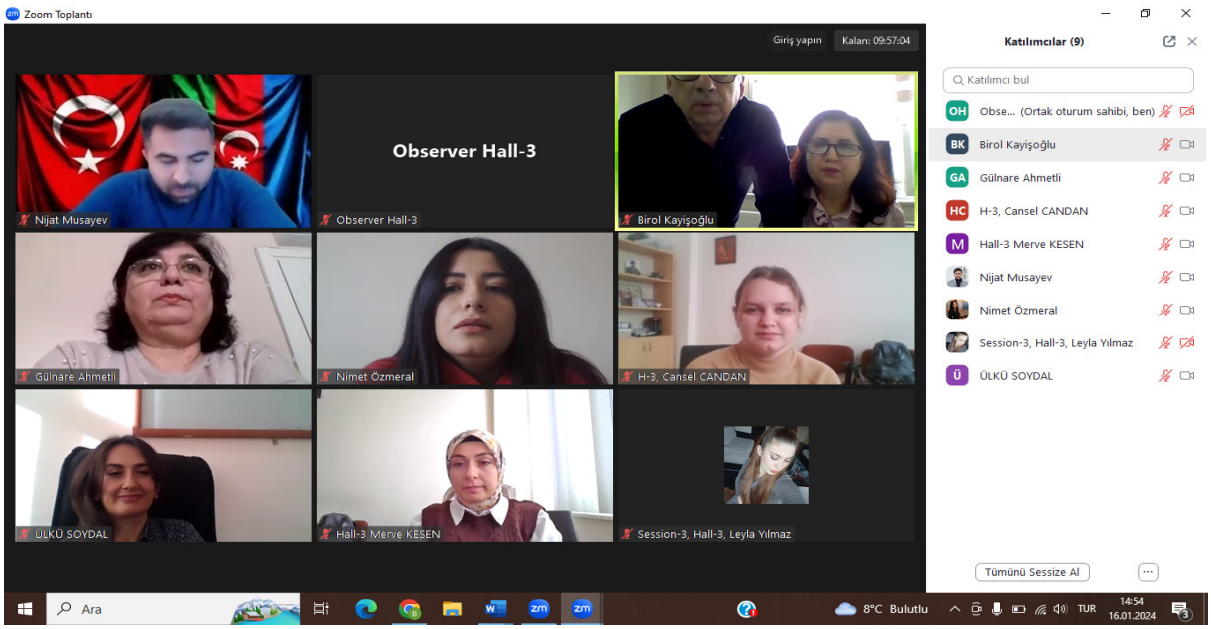
09:53
16.01.2024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Katılımcılar (9)
Katılımcı bul
Nijat Musayev
Observer Hall-3
Birol Kayişoğlu
Gülnare Ahmetli
Nimet Özmeral
H-3, Cansel CANDAN
ÜLKÜ SOYDAL
Hall-3 Merve KESEN
Session-3, Hall-3, Leyla Yılmaz
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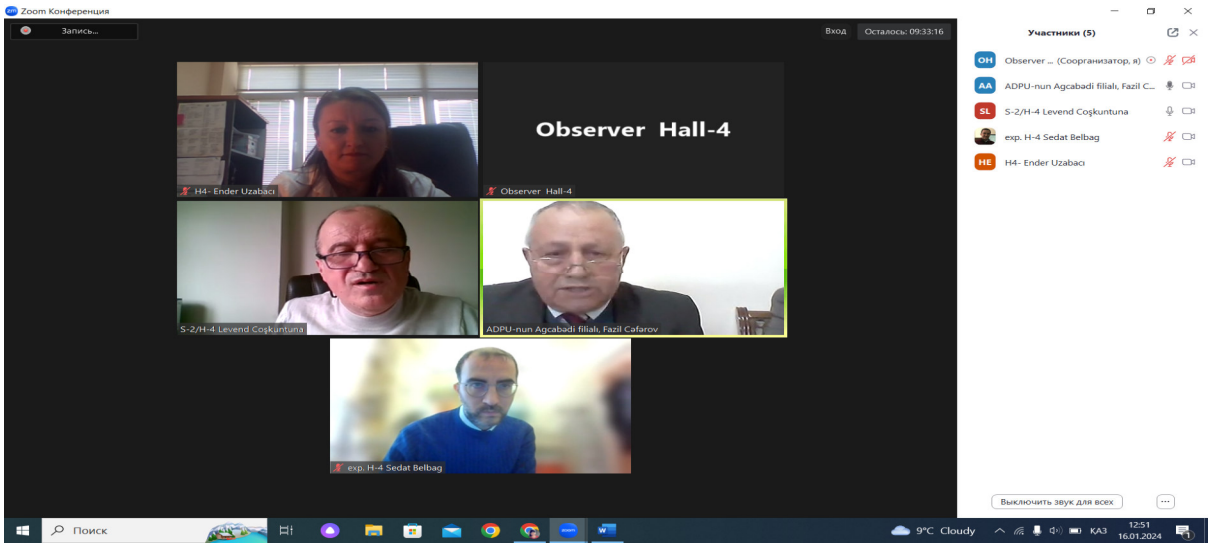
TUR
14:54
16.01.2024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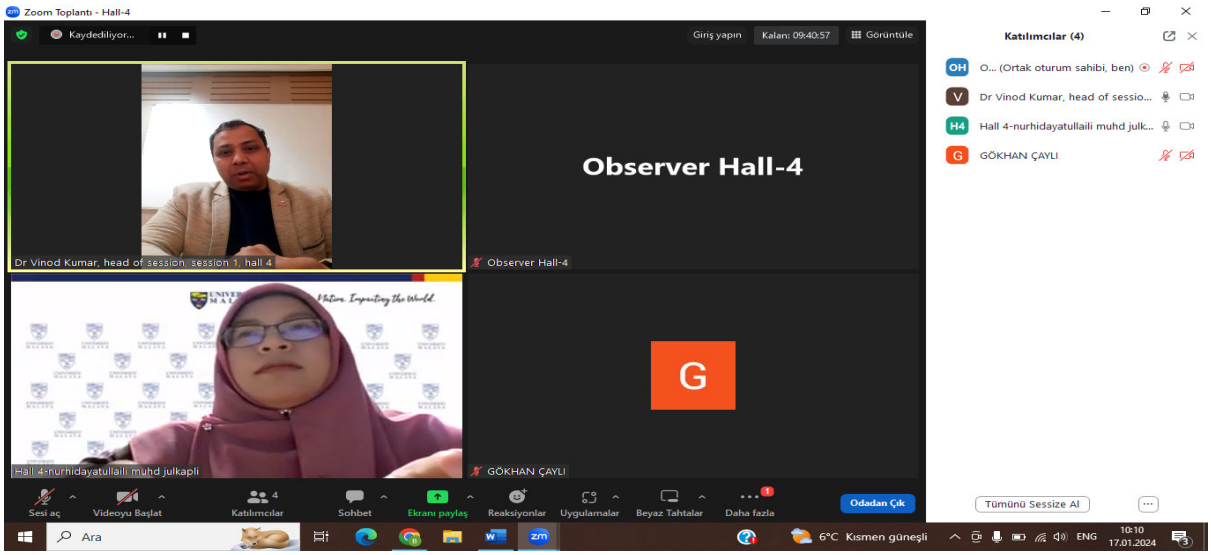
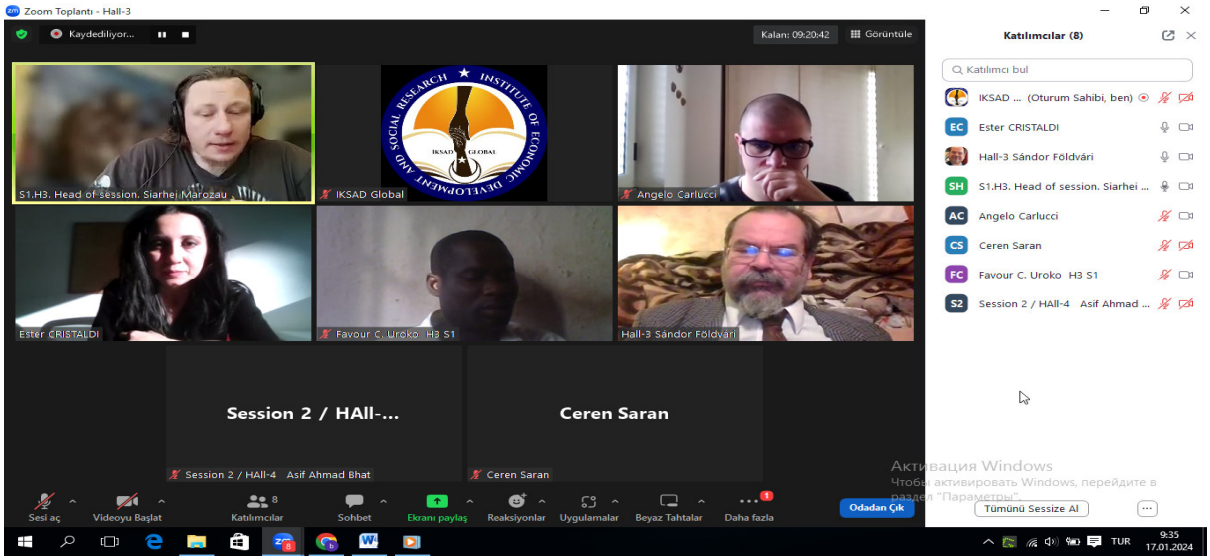
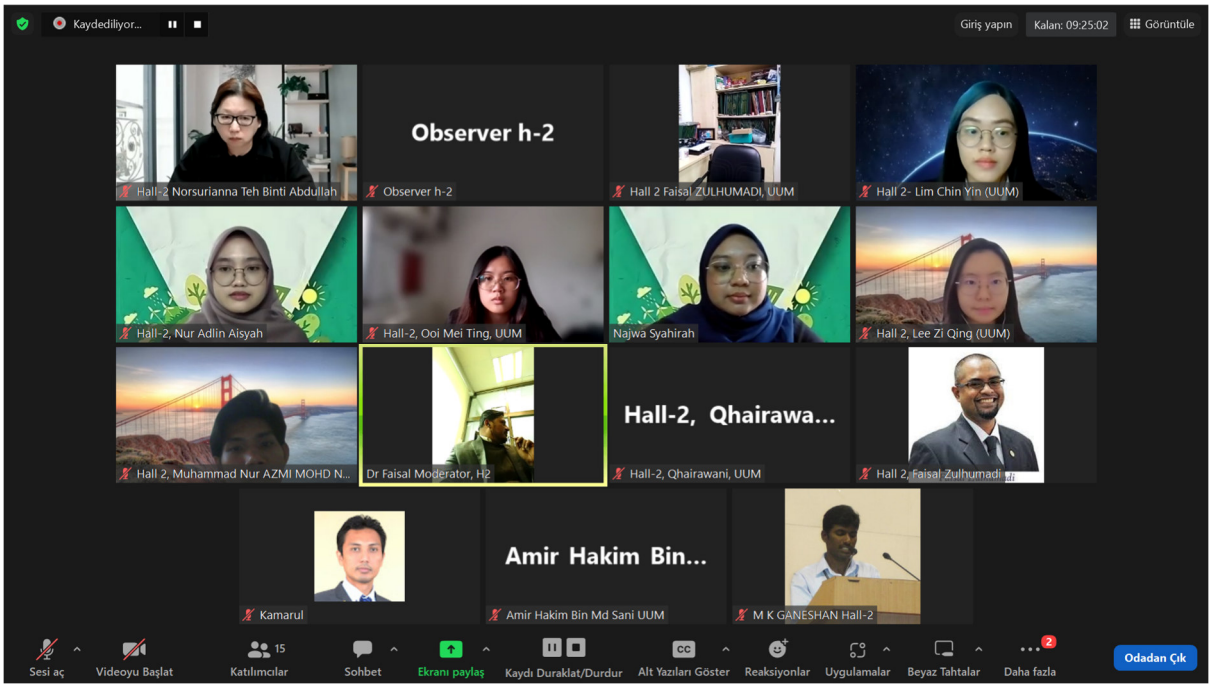
Осталось: 09:33:16
Observer Hall-4
Участники (5)
H4- Ender Uzabacı
Observer Hall-4
S-2/H-4 Levend Coşkuntuna
ADPU-nun Agcabadi filiali, Fazil Cafarov
exp. H-4 Sedat Belbag
Выключить звук для всех
Поиск
9°C Cloudy
KAZ
12:51
16.01.2024


Zoom Конференция - Hall-4
Observer Hall-4
H 4 Gheorghe Giurgiu
Observer Hall-4
Hall-4, Dr. Delbrin Ahmed
laila el archi
F
Hall-4 Fatih Yigit
1 неназначенный участник
Участники (5)
Observer ... (Сооргнизатор, я)
H 4 Gheorghe Giurgiu
Hall-4 Fatih Yigit
Hall-4, Dr. Delbrin Ahmed
laila el archi


Zoom Toplantı - Hall-4
Observer Hall-4
Dr Vinod Kumar, head of session, session 1, hall 4
Observer Hall-4
Hall 4-nurhidayatullaili muhd julkapli
G
GÖKHAN ÇAYLI
Katılımcılar (4)
O... (Ortak oturum sahibi, ben)
Dr Vinod Kumar, head of sessio...
Hall 4-nurhidayatullaili muhd julk...
GÖKHAN ÇAYLI


Zoom Toplantı - Hall-3
S1.H3. Head of session, Siarhei Marozau
IKSAD Global
Angelo Carlucci
Ester CRISTALDI
Favour C. Uroko H3 S1
Hall-3 Sándor Földvári
Session 2 / HAll-...
Session 2 / HAll-4 Asif Ahmad Bhat
Ceren Saran
Katılımcılar (8)
IKSAD ... (Oturum Sahibi, ben)
Ester CRISTALDI
Hall-3 Sándor Földvári
S1.H3. Head of session. Siarhei ...
Angelo Carlucci
Ceren Saran
Favour C. Uroko H3 S1
Session 2 / HAll-4 Asif Ahmad ...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Giriş yapın
Kalan: 09:25:02
Görüntüle
Observer h-2
Hall-2 Norsurianna Teh Binti Abdullah
Observer h-2
Hall 2 Faisal ZULHUMADI, UUM
Hall 2- Lim Chin Yin (UUM)
Hall-2, Nur Adlin Aisyah
Hall-2, Ooi Mei Ting, UUM
Najwa Syahirah
Hall 2, Lee Zi Qing (UUM)
Hall 2, Muhammad Nur AZMI MOHD N...
Dr Faisal Moderator, H2
Hall-2, Qhairawa...
Hall-2, Qhairawani, UUM
Hall 2, Faisal Zulhumadi
Kamarul
Amir Hakim Bin...
Amir Hakim Bin Md Sani UUM
M K GANESHAN Hall-2
Sesi aç
Videoyu Başlat
Katılımcılar
15
Sohbet
Ekranı paylaş
Kaydı Duraklat/Durdur
Alt Yazıları Göster
Reaksiyonlar
Uygulamalar
Beyaz Tahtalar
Daha fazla
Odadan Çık


Kaydediliyor...
Giriş yapın
Kalan: 09:36:39
Görüntüle
Osman MUTLUEL
Observer H-1
Observer H-1
Hall-1, Tugba Uzun Gedikli
ESRA YILDIZ
H-1 Nurettin Akcan
Emine Sarialioğlu
Sesi aç
Videoyu Başlat
Katılımcılar
6
Sohbet
Ekranı paylaş
Kaydı Duraklat/Durdur
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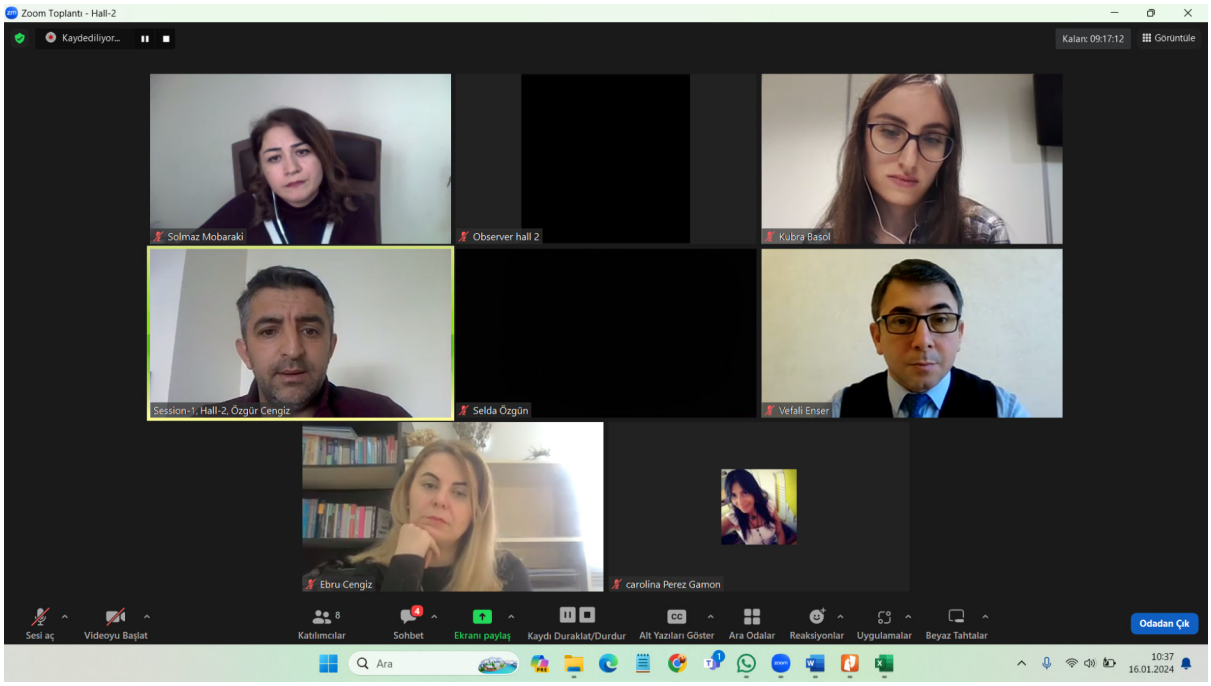
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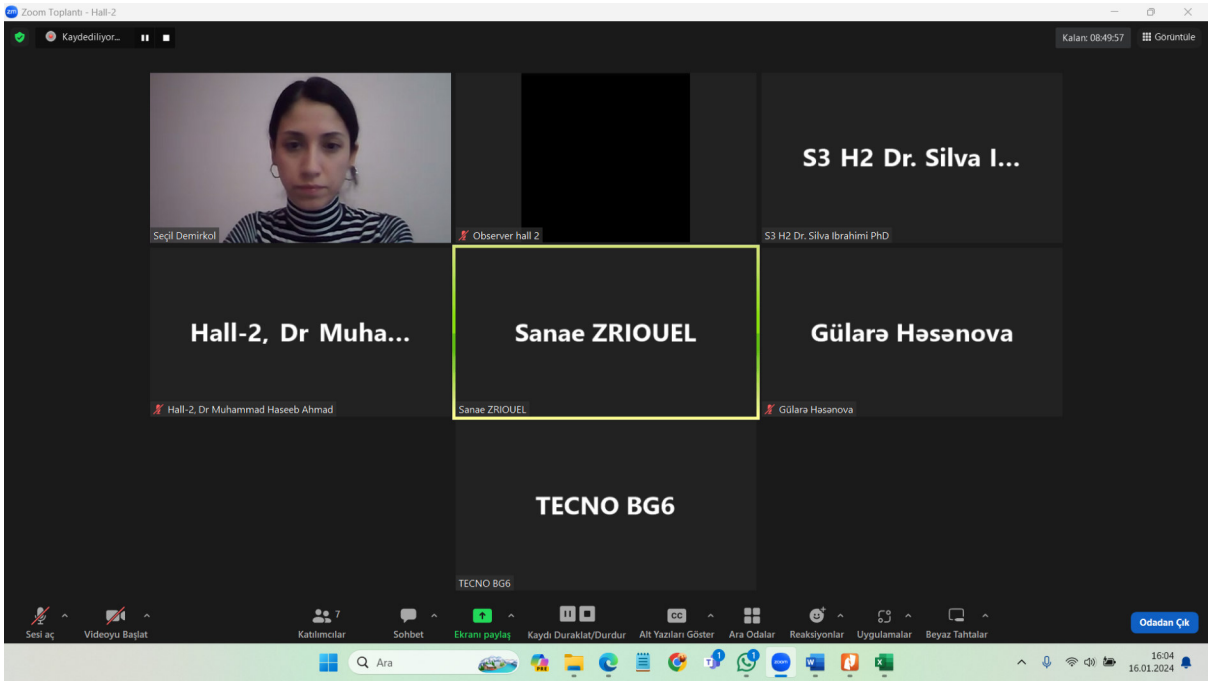
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ANALYTICAL SOLUTION OF FREE VIBRATION PROBLEM FOR AN AXISYMMETRIC CYLINDER

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ABSTRACT
Cylindrical structures are used in various fields of engineering. Solid cylinders serve as shafts in the powertrains of land, sea, and air vehicles, as rods in machinery, as well as pistons in hydraulic and pneumatic forming systems. They also act as structural support elements in architecture and civil engineering. These cylindrical elements, designed to fulfill specific roles or bear loads, operate under various working conditions. Examining their response to vibrations is a crucial engineering concern.

Conducting experimental studies for such investigations is not always feasible due to high costs. Therefore, a mathematical examination of the vibration of cylindrical elements provides valuable technical data for researchers and engineers, enabling significant improvements in subsequent designs.
This study focuses on the axisymmetric motion of a solid cylinder made of homogeneous, isotropic, linear elastic material. Navier-Lame equations, derived using the generalized Hooke's law, which establishes the relationship between stresses and strains of a linear elastic material, along with the dynamic equilibrium equations derived from Newton's second law of motion, are employed for this purpose. The Navier-Lame equations are suitable for problems with boundary conditions specified in terms of displacements. The study solves these equations using two different methods: the potential method and the Bessel method. In the potential method, the displacement vector is represented as a combination of a vector potential function and a scalar potential function. Substituting these representations into the vector form of the Navier-Lame equations yields a system of partial differential equations. On the other hand, in the Bessel method, the Navier-Lame equations are expressed in terms of radial and axial displacements in cylindrical coordinates. Displacements are initially assumed in terms of Bessel functions.
Both methods consider time-dependent harmonic wave motion in the axial direction of the solid material. The model assumes no stress on the outer surface of the cylinder. Solving the problem involves finding a non-zero solution for a set of homogeneous equations, considering the boundary conditions. The characteristic equation, giving the eigenvalue angular frequency, is found by setting the determinant of the 2x2 dimensional coefficient matrix equal to zero. As an analytical solution was not possible, a numerical solution was implemented. Graphs depicting the variation of angular frequency with respect to dimensionless wave number are provided for both methods. The results indicate compatibility between the two solution methods.
Keywords: Cylinder Vibration, Bessel, Potential Solution, Numerical Solution.

INTRODUCTION

Cylindrical structures find applications in various engineering fields. Solid cylinders, for instance, serve as shafts in the powertrains and machinery of land, sea, and air vehicles. They are also utilized as pistons in hydraulic and pneumatic forming systems, and as essential structural support elements in architecture and civil engineering. Analyzing the responses of cylindrical elements designed for specific functions or load-bearing purposes to vibrations encountered during operational conditions is a crucial engineering consideration.
Conducting experimental studies for such investigations is not always feasible due to the high cost associated with them. Therefore, a mathematical examination of the vibration characteristics of cylindrical elements proves invaluable, providing essential technical insights for researchers and engineers. The data obtained through these mathematical analyses contribute significantly to the improvement of subsequent designs, allowing for more informed and efficient engineering solutions.
D. C. Gazis (1959) conducted a three-dimensional investigation into the propagation of waves in hollow circular cylinders. Following this research, Gazis, along with Armenakas and Herman (2013), authored a reference textbook. This publication reviewed and documented principles of analysis for determining and modeling the free vibrations of circular cylindrical shells. Numerous researchers have cited this reference in their studies. McNiven et al., (1966) explored axially symmetric waves in hollow elastic rods, while Hutchinson (1980) delved into the axisymmetric vibrations of a free finite-length rod, a topic also addressed in our study.

Guo and Yang (2011), demonstrated the effectiveness of their proposed method for the one-dimensional analytical solution of vibrations propagating along the axis of a rod with variable cross-section, such as a cone profile. They utilized the Wentzel-Kramers-Brillouin (WKB) system, comparing it with a numerical solution using the method and Kummer functions. Eisenberger (1991), presented a method to determine the natural frequencies at which the stiffness of a rod becomes zero in his work. Similarly, Abrate (1995) evaluated simplified formulas for the analytical solution of free rods and rods connected at one end with polynomials in the Rayleigh-Ritz approach in his study. Kumar (1997), in his study, examined the dependence of the solution realized with the Bessel function on the variable cross-section, considering whether the end of the rod is connected or not. He also explored the adaptation of a similar approach to applications such as ventilation ducts. Raj and Sumith (2005) evaluated the natural frequencies of free-end and end-bonded variable cross-section rods using Kummer functions in their study.

MATERIAL AND METHOD

In this study, the axisymmetric motion of a solid cylinder composed of homogeneous, isotropic, linear elastic material is considered. To analyze this motion, the Navier-Lame equations are employed, derived using the generalized Hooke's law, which establishes the relationship between stresses and strains in a linear elastic material. Additionally, the dynamic equilibrium equations, formulated based on Newton's second law of motion, are utilized. The Navier-Lame equations are particularly well-suited for problems in which boundary conditions are specified in terms of displacements.

The Motion Equations for Solid Material in Cylindrical Coordinates

The axial symmetric motion of the solid material will be considered. The system of equations for solid material in cylindrical coordinates is expressed as follows, based on the Navier-Lame equations (Uysal 2019).

$$\left(\bar{\lambda}+2\bar{\mu}\right)\left(\frac{1}{r}\frac{\partial \mathcal{V}_r}{\partial r}-\frac{\mathcal{V}_r}{r^2}+\frac{\partial^2 \mathcal{V}_r}{\partial r^2}+\frac{\partial^2 \mathcal{V}_z}{\partial r\partial z}\right)+\bar{\mu}\left(\frac{\partial^2 \mathcal{V}_r}{\partial z^2}-\frac{\partial^2 \mathcal{V}_z}{\partial r\partial z}\right)=\rho\frac{\partial^2 \mathcal{V}_r}{\partial t^2} \quad (1)$$

$$\left(\bar{\lambda}+2\bar{\mu}\right)\left(\frac{1}{r}\frac{\partial \mathcal{V}_r}{\partial z}+\frac{\partial^2 \mathcal{V}_r}{\partial r\partial z}+\frac{\partial^2 \mathcal{V}_z}{\partial z^2}\right)+\bar{\mu}\left(\frac{\partial^2 \mathcal{V}_z}{\partial r^2}+\frac{1}{r}\frac{\partial \mathcal{V}_z}{\partial r}-\frac{1}{r}\frac{\partial \mathcal{V}_r}{\partial z}-\frac{\partial^2 \mathcal{V}_r}{\partial r\partial z}\right)=\rho\frac{\partial^2 \mathcal{V}_z}{\partial t^2} \quad (2)$$

Motion equations (1) and (2) $C_L^2=\frac{\bar{\lambda}+2\bar{\mu}}{\rho}$, $C_T^2=\frac{\bar{\mu}}{\rho}$ are rearranged, and are expressed as follows;

$$C_L^2\left(\frac{1}{r}\frac{\partial \mathcal{V}_r}{\partial r}-\frac{\mathcal{V}_r}{r^2}+\frac{\partial^2 \mathcal{V}_r}{\partial r^2}+\frac{\partial^2 \mathcal{V}_z}{\partial r\partial z}\right)+C_T^2\left(\frac{\partial^2 \mathcal{V}_r}{\partial z^2}-\frac{\partial^2 \mathcal{V}_z}{\partial r\partial z}\right)=\frac{\partial^2 \mathcal{V}_r}{\partial t^2} \quad (3)$$

$$C_L^2\left(\frac{1}{r}\frac{\partial \mathcal{V}_r}{\partial z}+\frac{\partial^2 \mathcal{V}_r}{\partial r\partial z}+\frac{\partial^2 \mathcal{V}_z}{\partial z^2}\right)+C_T^2\left(\frac{\partial^2 \mathcal{V}_z}{\partial r^2}+\frac{1}{r}\frac{\partial \mathcal{V}_z}{\partial r}-\frac{1}{r}\frac{\partial \mathcal{V}_r}{\partial z}-\frac{\partial^2 \mathcal{V}_r}{\partial r\partial z}\right)=\frac{\partial^2 \mathcal{V}_z}{\partial t^2} \quad (4)$$

In these equations $\bar{\lambda}$ ve $\bar{\mu}$: Lame constants (elastic constants).

$$\bar{\lambda}=\frac{E\,\upsilon}{(1+\upsilon)(1-2\upsilon)} \quad (5)$$

$$\bar{\mu}=\frac{E}{2(1+\upsilon)} \quad (6)$$

E: Elasticity modulus (Young's modulus), υ : Poisson number, $\mathcal{V}_r, \mathcal{V}_z$: displacements in radial and axial directions.

1. Bessel Solution for Cylindrical Geometry

Solution for Fundamental Equations

The equations of solid material will be considered for axial direction, involving time-dependent harmonic wave motion. Therefore, for the motion equations in cylindrical coordinates of the solid material, a harmonic solution will be sought by assuming the following forms:

$\mathcal{V}_r = \underline{A}\, B_1(\alpha r)\, e^{i(kz-\omega t)}$ (7)

$\mathcal{V}_z = \underline{D}\, B_0(\alpha r)\, e^{i(kz-\omega t)}$ (8)

Here $\underline{A}$ and $\underline{D}$ are arbitrary constants, B_0 : represents zeroth-order Bessel functions, B_1 : first order Bessel functions, k : is the wave number, ω : is the angular frequency. By substituting the expressions for Vr and Vz from (7) and (8) into the motion equations in (3) and (4) and making necessary adjustments,

$(\omega^2 - C_L^2\,\alpha^2 - C_T^2\,k^2)\underline{A} + (-ik\alpha(C_L^2 - C_T^2))\underline{D} = 0$ (9)

$(ik\alpha(C_L^2 - C_T^2))\underline{A} + (\omega^2 - C_T^2\,\alpha^2 - C_L^2\,k^2)\underline{D} = 0$ (10)

two linear algebraic equations can be obtained in this form. The matrix form of this system of linear equations is as follows:

$$\begin{bmatrix} \omega^2 - C_L^2\,\alpha^2 - C_T^2\,k^2 & (-ik\alpha(C_L^2 - C_T^2)) \\ (ik\alpha(C_L^2 - C_T^2)) & (\omega^2 - C_T^2\,\alpha^2 - C_L^2\,k^2) \end{bmatrix} \begin{bmatrix} \underline{A} \\ \underline{D} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \quad (11)$$

For the system of equations to have a non-trivial solution, the determinant of the coefficient matrix must be set equal to zero. Accordingly;

$[C_L^2\,C_T^2]\,\alpha^4 + [-\omega^2(C_L^2 + C_T^2) + k^2(C_L^2 + C_T^2) - k^2(C_L^2 - C_T^2)^2]\alpha^2$
$+[\omega^4 - \omega^2 k^2(C_L^2 + C_T^2) + C_L^2\,C_T^2\,k^4] = 0$ (12)

is obtained. In equation 12 constants are assumed as follows;

$a = C_L^2\,C_T^2$
$b = [-\omega^2(C_L^2 + C_T^2) + k^2(C_L^2 + C_T^2) - k^2(C_L^2 - C_T^2)^2]$ (13)
$c = [\omega^4 - \omega^2 k^2(C_L^2 + C_T^2) + C_L^2\,C_T^2\,k^4]$
$\alpha^2 = \bar{\beta}$

Accordingly equation (12) transforms into a second degree equation as follows:

$a\bar{\beta}^2 + b\bar{\beta} + c = 0$ (14)

From the solution of transformed equations we obtain following values:

$\alpha_{1,2} = \sqrt{\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$ (15)

$\alpha_{3,4} = -\sqrt{\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$ (16)

In these equtions,

$B_0(-\alpha r) = B_0(\alpha r)$ (17)

$B_1(-\alpha r) = -B_1(\alpha r)$ (18)

Are assumed, accordingly, for roots of α ,values of $\alpha_1$and α_2 can be accounted. Let, $B_0 = J_0$ and $B_1 = J_1$. In this equaiton, J_0 and J_1 : are first type Bessel functions. Rearranging $\mathcal{V}_r$ and $\mathcal{V}_z$, according to α_1 and α_2 ,also J_0 and J_1 , following is obtained;

$\mathcal{V}_r = [A_1 J_1(\alpha_1 r) + A_2 J_1(\alpha_2 r)]\; e^{i(kz-\omega t)}$ (19)

$\mathcal{V}_z = [D_1 J_0(\alpha_1 r) + D_2 J_0(\alpha_2 r)] e^{i(kz-\omega t)}$ (20)

By substituting these expressions, with expressions (3) and (4) of main equatioins, we obtain equation (22);

$\left[(\omega^2 - C_L^2\,\alpha_1^2 - C_T^2\,k^2)A_1 + \left(ik\alpha_1(C_T^2 - C_L^2)\right)D_1\right] J_1(\alpha_1 r) + \left[(\omega^2 - C_L^2\,\alpha_2^2 - C_T^2\,k^2)A_2 + \left(ik\alpha_2(C_T^2 - C_L^2)\right)D_2\right] J_1(\alpha_2 r) = 0$ (21)

$[(ik\alpha_1(C_L^2 - C_T^2))A_1 - (\omega^2 - C_T^2\alpha_1^2 - C_L^2\,k^2)D_1]\,J_0(\alpha_1 r) + [(ik\alpha_2(C_L^2 - C_T^2))A_1 - (\omega^2 - C_T^2\alpha_2^2 - C_L^2\,k^2)D_1]\,J_0(\alpha_2 r) = 0$ (22)

By using following assumptions;

$D_1 = A_1\varepsilon_1$ (23)

$D_2 = A_2\varepsilon_2$ (24)

Equation (21) becomes as follows;

$$\left[(\omega^2 - C_L^2\,\alpha_1^2 - C_T^2\,k^2)A_1 + \left(ik\alpha_1(C_T^2 - C_L^2)\right)A_1\varepsilon_1\right] = 0 \quad (25)$$

$$\varepsilon_1 = \frac{-(\omega^2 - C_L^2\,\alpha_1^2 - C_T^2\,k^2)}{\left(ik\alpha_1(C_T^2 - C_L^2)\right)} \quad (26)$$

$$\left[(\omega^2 - C_L^2\,\alpha_2^2 - C_T^2\,k^2)A_2 + \left(ik\alpha_2(C_T^2 - C_L^2)\right)A_2\varepsilon_2\right] = 0 \quad (27)$$

$$\varepsilon_2 = \frac{-(\omega^2 - C_L^2\,\alpha_2^2 - C_T^2\,k^2)}{\left(ik\alpha_2(C_T^2 - C_L^2)\right)} \quad (28)$$

Rearranging displacement expresssiions numbered as, we get

$$\mathcal{V}_r = [A_1 J_1(\alpha_1 r) + A_2 J_1(\alpha_2 r)]\; e^{i(kz-\omega t)} \quad (29)$$

$$\mathcal{V}_z = [A_1\varepsilon_1 J_0(\alpha_1 r) + A_2\varepsilon_2 J_0(\alpha_2 r)]e^{i(kz-\omega t)} \quad (30)$$

Boundary Conditions and Shear Elements

$$\tau_{rr}^* = \bar{\lambda}\left(\frac{1}{r}\frac{\partial(r\mathcal{V}_r)}{\partial r} + \frac{\partial \mathcal{V}_z}{\partial z}\right) + 2\bar{\mu}\,\frac{\partial \mathcal{V}_r}{\partial r} \quad (31)$$

$$\tau_{rz}^* = \tau_{zr}^* = \bar{\mu}\left(\frac{\partial \mathcal{V}_z}{\partial r} + \frac{\partial \mathcal{V}_r}{\partial z}\right) \quad (32)$$

Rearranging boundary conditions numbered as (31) and (32), expressions (29) are (30) are obtained as follows:

$$\tau_{rr}^* = \left(\left[-2\bar{\mu}\frac{1}{r}J_1(\alpha_1 r) + \left(\bar{\lambda}ik\varepsilon_1 + \left(\bar{\lambda} + 2\bar{\mu}\right)\alpha_1\right)J_0(\alpha_1 r)\right]A_1 + \left[-2\bar{\mu}\frac{1}{r}J_1(\alpha_2 r) + \left(\bar{\lambda}ik\varepsilon_2 + \left(\bar{\lambda} + 2\bar{\mu}\right)\alpha_2\right)J_0(\alpha_2 r)A_2\right]\right)e^{i(kz-\omega t)} \quad (33)$$

$$\tau_{rz}^* = \bar{\mu}[(ik - \alpha_1\varepsilon_1)J_1(\alpha_1 r)A_1 + (ik - \alpha_2\varepsilon_2)J_1(\alpha_2 r)A_2]e^{i(kz-\omega t)} \quad (34)$$

In the model, it is assumed that there is no stress on the outer surface of the solid material. Therefore, the stress components on the outer surface of the solid material must be zero. Accordingly, for $r = a$ condition,

$$\tau_{rr}^* = 0 \quad (35)$$

$$\tau_{rz}^* = 0 \quad (36)$$

From equations (33) and (35);

$$\left[-2\bar{\mu}\frac{1}{a}J_1(\alpha_1 a) + \left(\bar{\lambda}ik\varepsilon_1 + \left(\bar{\lambda} + 2\bar{\mu}\right)\alpha_1\right)J_0(\alpha_1 a)\right]A_1 + \left[-2\bar{\mu}\frac{1}{a}J_1(\alpha_2 a) + \left(\bar{\lambda}ik\varepsilon_2 + \left(\bar{\lambda} + 2\bar{\mu}\right)\alpha_2\right)J_0(\alpha_2 a)\right]A_2 = 0 \quad (37)$$

From equations (34) and (36) we obtaion following equations;

$$[(ik - \alpha_1\varepsilon_1)J_1(\alpha_1 a)A_1 + (ik - \alpha_2\varepsilon_2)J_1(\alpha_2 a)A_2] \quad (38)$$

The dimensional expressions obtained using the dimensionless parameters and variables defined in Equation (39) can be nondimensionalized.

$$\mathrm{p}^2 = \frac{\omega^2}{\mathrm{C_L^2}} - \mathrm{k}^2 \qquad q^2 = \frac{\omega^2}{C_T^2} - k^2$$

$$\Omega = \frac{\omega\, a}{C_T} \qquad \xi = k\, a \quad (39)$$

$$x^2 = (qa)^2 = \Omega^2 - \xi^2 \qquad \gamma^2 = \frac{C_L^2}{C_T^2} = \frac{2(1-\upsilon)}{1-2\upsilon}$$

$$y^2 = (pa)^2 = \gamma^{-2}\Omega^2 - \xi^2$$

According to these parameters and variables:

From equations (12) , (13) and (15);

$$\alpha^4 + \left[\frac{1}{a^2}[-\xi^2(1+\gamma^{-2}) + 2\xi^2])\right]\alpha^2 + \left[\frac{1}{a^2}(\Omega^2 - \xi^2)(\gamma^{-2}\Omega^2 - \xi^2)\right]=0 \quad (40)$$

$$a = 1\,,\quad b = \left[\frac{1}{a^2}[-\Omega^2(1+\gamma^{-2}) + 2\xi^2])\right],\qquad c = \left[\frac{1}{a^2}(\Omega^2 - \xi^2)(\gamma^{-2}\Omega^2 - \xi^2)\right] \quad (41)$$

$$\alpha_1 = \sqrt{\frac{-b+\sqrt{b^2-4ac}}{2a}} \qquad \alpha_2 = \sqrt{\frac{-b-\sqrt{b^2-4ac}}{2a}} \quad (42)$$

From equations (26) and (28);

$$\varepsilon_1 = \frac{\gamma^2\alpha_1^2 - \frac{1}{a^2}(\Omega^2-\xi^2)}{i\frac{\xi}{a}\alpha_1(1-\gamma^2)} \quad (43)$$

$$\varepsilon_2 = \frac{\gamma^2\alpha_2^2 - \frac{1}{a^2}(\Omega^2-\xi^2)}{i\frac{\xi}{a}\alpha_2(1-\gamma^2)} \quad (44)$$

From equation (37),

$$\left[-2J_1(\alpha_1 a) + \left(a(\gamma^2-2)\left(\frac{\gamma^2\alpha_1^2 - \frac{1}{a^2}(\Omega^2-\xi^2)}{\alpha_1(1-\gamma^2)}\right) + a\,\gamma^2\,\alpha_1\right)J_0(\alpha_1 a)\right]A_1 + \left[-2J_1(\alpha_2 a) + \left(a(\gamma^2-2)\left(\frac{\gamma^2\alpha_2^2 - \frac{1}{a^2}(\Omega^2-\xi^2)}{\alpha_2(1-\gamma^2)}\right) + a\,\gamma^2\,\alpha_2\right)J_0(\alpha_2 a)\right]A_2 = 0 \quad (45)$$

From equation (38), following equation is obtained.

$$\left[\left(-\frac{\xi^2}{a^2} + \left(\frac{\frac{1}{a^2}(\Omega^2-\xi^2) - \gamma^2\alpha_1^2}{(1-\gamma^2)}\right)\right)J_1(\alpha_1 a)\right]A_1 + \left[\left(-\frac{\xi^2}{a^2} + \left(\frac{\frac{1}{a^2}(\Omega^2-\xi^2) - \gamma^2\alpha_2^2}{(1-\gamma^2)}\right)\right)J_1(\alpha_2 a)\right]A_2 = 0 \quad (46)$$

Equations (45) and (46), obtained based on the boundary conditions of the problem, were utilized to find a system of linear homogeneous equations dependent on coefficients A_1 and A_2. For this angular frequency, it is an algebraic eigenvalue problem. The matrix form of this system of linear homogeneous equations is as stated below;

$$\begin{bmatrix} K_{11} & K_{12} \\ K_{21} & K_{22} \end{bmatrix} \begin{bmatrix} A_1 \\ A_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \quad (47)$$

Here; elements of matrix are

$$K_{11} = \left[-2J_1(\alpha_1 a) + \left(a(\gamma^2-2)\left(\frac{\gamma^2\alpha_1^2 - \frac{1}{a^2}(\Omega^2-\xi^2)}{\alpha_1(1-\gamma^2)}\right) + a\,\gamma^2\,\alpha_1\right)J_0(\alpha_1 a)\right]$$

$$K_{12} = \left[-2J_1(\alpha_2 a) + \left(a(\gamma^2-2)\left(\frac{\gamma^2\alpha_2^2 - \frac{1}{a^2}(\Omega^2-\xi^2)}{\alpha_2(1-\gamma^2)}\right) + a\,\gamma^2\,\alpha_2\right)J_0(\alpha_2 a)\right]$$

$$K_{21} = \left[\left(-\frac{\xi^2}{a^2} + \left(\frac{\frac{1}{a^2}(\Omega^2-\xi^2) - \gamma^2\alpha_1^2}{(1-\gamma^2)}\right)\right)J_1(\alpha_1 a)\right]$$

$$K_{22} = \left[\left(-\frac{\xi^2}{a^2} + \left(\frac{\frac{1}{a^2}(\Omega^2-\xi^2) - \gamma^2\alpha_2^2}{(1-\gamma^2)}\right)\right)J_1(\alpha_2 a)\right]$$

as stated above. To obtain a nontrivial solution for this homogeneous system of equations, it is necessary to set the determinant of the (2x2) coefficient matrix equal to zero. This condition is the characteristic equation that provides the eigenvalue angular frequency. This characteristic equation is a function of the dimensionless wave number (ξ) and the angular frequency (Ω).

2. Solution with Potentials Method

The equations of motion for a linear, homogeneous, isotropic elastic solid are expressed through the Navier-Lame equation. Due to the general complexity of Navier-Lame equations, often not amenable to straightforward solutions like separation of variables, a specialized approach known as the method of potentials has been introduced. In this method, the displacement vector is expressed as a combination of one or more scalar and/or vector functions, termed as potentials. By substituting these representations in terms of displacement potentials into the Navier-Lame equations, a system of partial differential equations is derived, which is less dependent or, at the very least, simplified in comparison to the original component equations. The Navier-Lame equation can be formulated in vector form as follows:

$$\mu\nabla^2\boldsymbol{\mathcal{V}} + (\lambda+\mu)\boldsymbol{\nabla\nabla}.\boldsymbol{\mathcal{V}} = \rho\ddot{\boldsymbol{\mathcal{V}}} \quad (48)$$

In this equation, $\mathcal{V}$,is the displacement vector.

Displacement vector ($\mathcal{V}$), A vector potential function ψ s composed of the combination with a scalar potential function φ and it is defined as follows.

$$\mathcal{V} = \nabla\varphi + (\nabla\, x\, \psi) \quad (49)$$

Here;

$$\nabla\varphi = \frac{\partial\varphi}{\partial r}e_r + \frac{1}{\mathrm{r}}\frac{\partial\varphi}{\partial\theta}\mathrm{e}_\theta + \frac{\partial\varphi}{\partial z}e_z \quad (50)$$

$$\nabla\, x\, \psi = \left(\frac{1}{\mathrm{r}}\frac{\partial\psi_z}{\partial\theta} - \frac{\partial\psi_\theta}{\partial\mathrm{z}}\right)e_r + \left(\frac{\partial\psi_r}{\partial z} - \frac{\partial\psi_z}{\partial\mathrm{r}}\right)\mathrm{e}_\theta + \left(\frac{\partial\psi_\theta}{\partial\mathrm{r}} + \frac{1}{\mathrm{r}}\,\psi_\theta - \frac{1}{\mathrm{r}}\frac{\partial\psi_r}{\partial\theta}\right)e_z \quad (51)$$

For solid material in the axial direction, a time-dependent harmonic wave motion will be considered. Therefore, the displacement vector is given by:

$$\mathcal{V} = \mathcal{V}_r(r,z)e_r + \mathcal{V}_z(r,z)e_z \quad (52)$$

Here, $\bar{\lambda}$ ve $\bar{\mu}$: are Lame constants (Elastic constants).

$$\bar{\lambda} = \frac{E\,\upsilon}{(1+\upsilon)(1-2\upsilon)} \qquad \bar{\mu} = \frac{E}{2(1+\upsilon)}$$

E: Elasticity modulus (Young's modulus), υ : Poisson number, $\mathcal{V}_r, \mathcal{V}_z$: displacements in radial and axial directions. Also,

$$\varphi = \varphi(r,z)$$

$$\psi_r = \psi_z = 0 \qquad \psi_\theta = \psi(r,z)\ \mathrm{e}_\theta \quad (53)$$

Accordingly, rearranging equation(4);

$$\nabla\, x\, \psi = -\frac{\partial\psi}{\partial z}e_r + \left(\frac{\partial\psi}{\partial r} + \frac{1}{\mathrm{r}}\psi\right)e_z \quad (54)$$

$$\mathcal{V}_r = \frac{\partial\varphi}{\partial r} - \frac{\partial\psi}{\partial z} \quad (55)$$

$$\mathcal{V}_z = \frac{\partial\varphi}{\partial z} + \frac{\partial\psi}{\partial r} + \frac{1}{r}\psi \quad (56)$$

From Navier-Lame equation as expressed in equation(48);

$$\nabla\left[(\bar{\lambda}+2\bar{\mu})\nabla^2\varphi - \rho\varphi''\right] + \nabla x[\bar{\mu}\,\nabla^2\psi - \rho\psi''] = 0 \quad (57)$$

$$(\bar{\lambda}+2\bar{\mu})\nabla^2\varphi = \rho\frac{\partial^2\varphi}{\partial t^2} \quad (58)$$

$$\bar{\mu}\,\nabla^2\psi = \rho\frac{\partial^2\vec{\psi}}{\partial t^2} \quad (59)$$

$$C_L^2 = \frac{\bar{\lambda}+2\bar{\mu}}{\rho} \quad , \quad C_T^2 = \frac{\bar{\mu}}{\rho} \quad (60)$$

Rearranging equation (58) and (59);

$$C_L^2\ \nabla^2\varphi = \frac{\partial^2\varphi}{\partial t^2} \quad (61)$$

$$C_T^2\ \nabla^2\vec{\psi} = \frac{\partial^2\vec{\psi}}{\partial t^2} \quad (62)$$

$$\varphi = f(r)e^{i(kz-\omega t)} \quad (63)$$

$$\psi_\theta = g(r)\ e^{i(kz-\omega t)}\hat{e}_\theta \quad (64)$$

a harmonic solution will be sought by assuming the form above. φ element in equation (63), is written in equation (64) and rearranging,

$$C_L^2\left(f'' + \frac{1}{r}f' - k^2 f\right) = -\omega^2 f \quad (65)$$

$$f'' + \frac{1}{r}f' + \left(\frac{\omega^2}{C_L^2} - k^2\right)f = 0 \quad (66)$$

ordinary differential equation solution from equation (66)

$$f(r) = A\,J_0(pr) + B\,Y_0(pr) \quad (67)$$

is obtained. To be defined in r = 0, following term becomes

$$f(r) = A\,J_0(pr) \quad (68)$$

$\vec{\psi}$ term in equation(64) is written in equation (62)and rearranging

$$C_T^2\left(g'' + \frac{1}{r}g' - k^2 g - \frac{1}{r^2}g\right) = -\omega^2 g \quad (69)$$

$$g'' + \frac{1}{r}g' + \left(\frac{\omega^2}{C_L^2} - k^2 - \frac{1}{r^2}\right)g = 0 \quad (70)$$

ordinary differential equation solution from equation (70)

$$g(r) = C\,J_1(qr) + D\,Y_1(qr) \quad (71)$$

is obtained. To be defined in r = 0, following term becomes;

$$g(r) = C\,J_1(qr) \quad (72)$$

Here;

$$p^2 = \frac{\omega^2}{c_L^2} - k^2 \qquad q^2 = \frac{\omega^2}{c_T^2} - k^2 \quad (73)$$

From equations (63) and (64);

$$\varphi = A\,J_0(pr)e^{i(kz-\omega t)} \quad (74)$$

$$\psi_\theta = C\,J_1(qr)e^{i(kz-\omega t)} \quad (75)$$

From equations (55) and (56);

$$\mathcal{V}_r = [-ApJ_1(pr) - (ik)CJ_1(qr)]\ e^{i(kz-\omega t)} \quad (76)$$

$$\mathcal{V}_z = [(ik)AJ_0(pr) + CqJ_0(qr)]\ e^{i(kz-\omega t)} \quad (77)$$

Are obtained.

Boundary Conditions and Shear Elements

$$\tau_{rr}^* = \bar{\lambda}\left(\frac{1}{r}\frac{\partial(r\mathcal{V}_r)}{\partial r} + \frac{\partial\mathcal{V}_z}{\partial z}\right) + 2\bar{\mu}\,\frac{\partial\mathcal{V}_r}{\partial r} \quad (78)$$

$$\tau_{rz}^* = \tau_{zr}^* = \bar{\mu}\left(\frac{\partial\mathcal{V}_z}{\partial r} + \frac{\partial\mathcal{V}_r}{\partial z}\right) \quad (79)$$

Boundary conditions in equations (78) and (79), are rearranged with the terms in equations (76) and (77) following is found;

$$\tau_{rr} = A\left[\left(-p^2(\bar{\lambda}+2\bar{\mu}) - \bar{\mu}\,k^2\right)J_0(pr) + 2\,\bar{\mu}\,p\,\frac{1}{r}\,J_1(pr)\right] + C\left[-2\,\bar{\mu}\,i\,k\,q\,J_0(qr) + 2\,\bar{\mu}i\,k\,\frac{1}{r}\,J_1(qr)\right] \quad (80)$$

$$\tau_{rz} = A[-2\bar{\mu}ikp\,J_1(pr)] + C[\bar{\mu}(k^2 - q^2)J_1(qr)] \quad (81)$$

In the model, it is assumed that there is no stress on the outer surface of the solid material. Therefore, the stress components on the outer surface of the solid material should be zero. Accordingly, for $r = a$ situation,

$$\tau_{rr}^{*} = 0 \quad (82)$$

$$\tau_{rz}^{*} = 0 \quad (83)$$

From equations (33) ,(34), (35) and (36)

$$\tau_{rz} = 0 \Rightarrow A[-2ikpJ_1(pa)] - C[(q^2 - k^2)J_1(qa)] = 0 \quad (84)$$

$$\tau_{rr} = 0 \Rightarrow A\left[-\frac{1}{2}(q^2 - k^2)J_0(pa) + p\frac{1}{a}J_1(pa)\right] + C\left[-ikqJ_0(qa) + ik\frac{1}{a}J_1(qa)\right] = 0 \quad (85)$$

Using the equations obtained based on the boundary conditions of the problem, namely (84) and (85), a system of linear homogeneous equations dependent on coefficients A and C has been found. For this angular frequency, it is an algebraic eigenvalue problem. The matrix form of this system of linear homogeneous equations is as stated below;

$$\begin{bmatrix} K_{11} & K_{12} \\ K_{21} & K_{22} \end{bmatrix} \begin{bmatrix} A \\ C \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \quad (86)$$

Here;

$$K_{11} = \left[-\frac{1}{2}(q^2 - k^2)J_0(pa) + p\frac{1}{a}J_1(pa)\right]$$

$$K_{12} = \left[-ikqJ_0(qa) + ik\frac{1}{a}J_1(qa)\right]$$

$$K_{21} = [-2ikpJ_1(pa)]$$

$$K_{22} = [(q^2 - k^2)J_1(qa)]$$

To obtain a nontrivial solution for this homogeneous system of equations, it is necessary to set the determinant of the (2x2) coefficient matrix equal to zero. This condition is the characteristic equation that provides the eigenvalue angular frequency. This characteristic equation is a function of the dimensionless wave number (ξ) and the angular frequency (Ω).

$$\begin{vmatrix} -\frac{1}{2}(q^2 - k^2)J_0(pa) + p\frac{1}{a}J_1(pa) & -ikqJ_0(qa) + ik\frac{1}{a}J_1(qa) \\ -2ikpJ_1(pa) & -(q^2 - k^2)J_1(qa) \end{vmatrix} = 0 \quad (87)$$

$$\left[-\frac{1}{2}(q^2 - k^2)J_0(pa) + p\frac{1}{a}J_1(pa)\right][\ -(q^2 - k^2)J_1(qa)] - \left[\left[-ikqJ_0(qa) + ik\frac{1}{a}J_1(qa)\right](-2ikpJ_1(pa))\right] = 0 \quad (88)$$

$$\frac{2p}{a}(q^2 + k^2)J_1(pa)J_1(qa) - (q^2 - k^2)^2J_0(pa)J_1(qa) - 4k^2pqJ_1(pa)J_0(qa) = 0 \quad (89)$$

Non-dimensionalizing,

$$\Omega = \frac{\omega a}{c_T}\ ,\ \xi = ka\ ,\ x^2 = (qa)^2 = \Omega^2 - \xi^2\ ,\ \gamma^2 = \frac{c_L^2}{c_T^2} = \frac{\lambda+2\mu}{\mu} = \frac{2(1-\nu)}{1-2\nu}$$

$$y^2 = (pa)^2 = \gamma^{-2}\Omega^2 - \xi^2 \quad (90)$$

By using non-dimensional parameters and variables as defined in equation (43) dimensional terms can be on-dimensionalized. According to these parameters and variables, form equation (89);

$$(\Omega^2 - 2\xi^2)^2J_0(y)J_1(x) + 4xy\xi^2J_0(x)J_1(y) - 2y\Omega^2J_1(y)J_1(x) = 0 \quad (91)$$

is obtatined.

$$\xi = 0 \Rightarrow \Omega^4J_0(y)J_1(x) - 2y\Omega^2J_1(y)J_1(x) = 0 \quad (92)$$

$$\Longrightarrow \Omega^3J_1(\Omega)\left[\Omega\frac{J_0(\gamma^{-1}\Omega)}{2} - \gamma^{-1}J_1(\gamma^{-1}\Omega)\right] = 0 \quad (93)$$

Condition 1 $\rightarrow J_1(\Omega) = 0$ (94)

Condition 2 $\rightarrow \left[\Omega\frac{J_0(\gamma^{-1}\Omega)}{2} - \gamma^{-1}J_1(\gamma^{-1}\Omega)\right] = 0$ (95)

An analytical solution for the system of equations was not possible, so a numerical solution was employed. In numerical computations, the Poisson ratio for the solid material was taken as υ = 0,3317 . Values for the shear frequencies were obtained by setting the dimensionless wave number $\xi = 0$.

RESULTS

Due to the lack of an analytical solution for the equation systems obtained from Bessel and potential solutions for the cylinder, numerical solutions were employed. In numerical computations, the Poisson ratio for the solid material was taken as $\upsilon = 0{,}3317$ The obtained values for the shear frequencies, with a dimensionless wave number $\xi = 0$ et to 0 for both solutions, are provided in Table 1.

Table 1. Shear frequencies obtained from Bessel and Potentials solutions

Solution Method	**Shear Frequencies**								
Bessel	3.8317	4.3119	7.0156	10.1735	10.8139	13.3237	17.1273	16.4706	19.6159
Potentials	3.8317	4.3119	7.0156	10.1735	10.8139	13.3237	17.1273	16.4706	19.6159

Figure 1 presents the results obtained using the Bessel function solution method for solid material with cylindrical geometry, while Figure 2 shows the results obtained with the potential approach. In the figures, the variation of dimensionless angular frequency (Ω) with dimensionless wave number (ξ) for different eigenvalues is depicted in different colors. It is observed that the eigenvalues are the same for both methods.

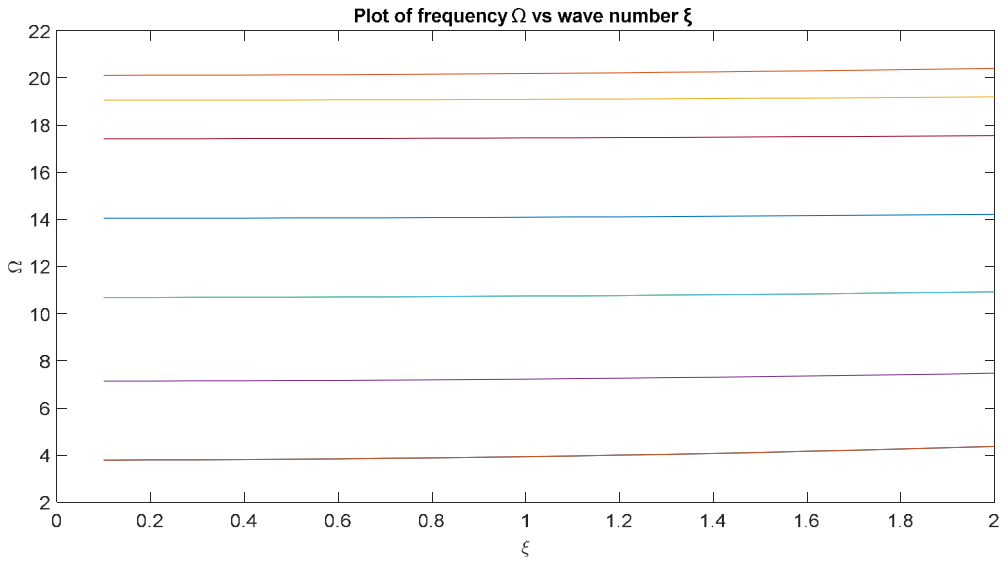

Figure 1. Dimensionless wave number in Bessel solution (ξ) and variation of angular frequency (Ω)

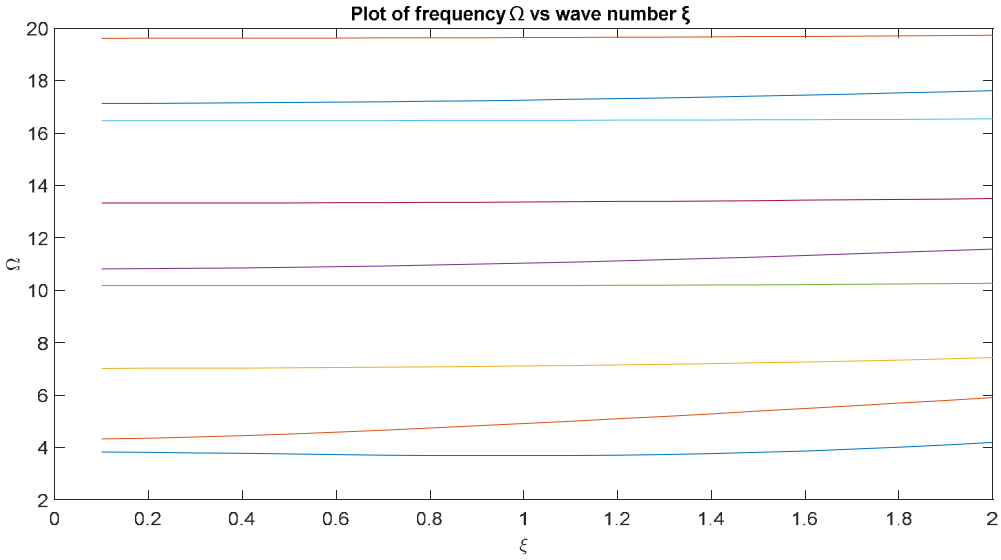

Figure 2. Dimensionless wave number in Potentials solution (ξ) and variation of angular frequency (Ω)

DISCUSSION AND CONCLUSION

In this study, the axisymmetric motion of a solid cylinder composed of homogeneous, isotropic, linear elastic material was investigated. The relationship between stresses and strains in linear elastic materials was modeled using the Navier-Lame equations, which were derived from dynamic equilibrium equations based on the generalized Hooke's law and Newton's second law of motion.

Two distinct methods, the potential method and the Bessel method, were employed to solve these equations. In the potential method, the displacement vector was represented as a combination of a vector potential function and a scalar potential function. Substituting these representations into the vector form of the Navier-Lame equations yielded a system of partial differential equations. Meanwhile, in the Bessel method, the Navier-Lame equations were expressed in terms of radial and axial displacements in cylindrical coordinates, and the solution was initially considered in terms of Bessel functions.

Both methods considered time-dependent harmonic wave motion in the axial direction of the cylindrical material. The model assumed no stress on the outer surface of the cylinder. The problem's solution was then reduced to finding a non-zero solution for a set of homogeneous equations while adhering to the boundary conditions. By setting the determinant of the 2x2 dimensional coefficient matrix equal to zero, the characteristic equation providing the eigenvalue angular frequency was obtained. Due to the complexity of the resulting set of equations, an analytical solution was not feasible, prompting the use of a numerical solution.

For both methods, the graphical representation of angular frequency variation with respect to dimensionless wave number is presented. The comparison of Figure 1 and Figure 2 illustrates the compatibility between the two solution methods.

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Hörmətli Dr. Mustafa Latif EMEK!

Sizin 27 noyabr 2023-cü il tarixli AZE-72 saylı məktubunuza cavab olaraq bildiririk ki, ***"9. Asya Pasifik Uluslararasi Modern Bilimler Kongresi"***ni **https://www.iksadasia.org/** 16-18 yanvar 2024-cü il tarixlərində, ***"8.Uluslararası ICONTECH Pozitif Bilimlerde Yenilikçi Araştırmalar Kongresi"*** ni isə **https://tr.icontechsurveys.org/** 16-18 mart 2024-cü il tarixlərində Azərbaycan Kooperasiya Universiteti, Dehli Universiteti, Türkiyənin İqtisadi İnkişaf və Sosial Tədqiqatlar İnstitutu ilə birgə oflayn və ya onlayn keçirmək üçün ev sahibliyi etməkdən məmnun olardıq.

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İLGİLİ MAKAMA

9. ASYA PASİFİK ULUSLARARASI MODERN BİLİMLER KONGRESİ 16-18 Ocak 2024 tarihleri arasında Bakü / Azerbaycan'da 24 farklı ülkenin (Türkiye-61, Diğer Ülkelerden-74) akademisyen/araştırmacılarının katılımıyla gerçekleşmiştir. Kongre 16 Ocak 2020 Akademik Teşvik Ödeneği Yönetmeliğine getirilen "Tebliğlerin sunulduğu yurt içinde veya yurt dışındaki etkinliğin uluslararası olarak nitelendirilebilmesi için Türkiye dışında en az beş farklı ülkeden sözlü tebliğ sunan konuşmacının katılım sağlaması ve tebliğlerin yarıdan fazlasının Türkiye dışından katılımcılar tarafından sunulması esastır." değişikliğine uygun düzenlenmiştir.

Bilgilerinize arz edilir,
Saygılarımla

Prof. Dr. Bəyalı Ataşov
Vice Rector of Azerbaijan Cooperation University
Head of the Organizing Committee