#### Paper / Subject Code: 89423 / Heating, Ventilation, Air Conditioning and Refrigeration

1T01436 - T.E. (Mechanical) Engineering)(SEM-VI)(Choice Base Credit Grading System.) ((R-20-21) (C Scheme) / 89423 - Heating. Ventilation, Air Conditioning and Refrigeration QP CODE: 10015040 DATE: 13/12/2022 (3 Hours)

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- Question no. 1 is compulsory.
- Attempt any three questions out of the remaining five questions.
- Clearly mention the assumptions made if any.
- 4) Use of Refrigerant table, P-h chart, Friction chart, Psychrometric chart and Steam table is permitted.
- O.1 Answer any Four of the following:

- a) Explain Standard VCR cycle with schematic, P-h & T-S diagrams.
- b) Explain the terms SHF, RSHF, GSHF and ERSHF.
- c) Define refrigerant and classify refrigerant giving examples of each.
- d) Define By-Pass Factor of a coil. Express it for heating & cooling coil. Also define efficiency of coil.
- e) Write short note on Thermal Comfort
- Define: Specific Humidity, Relative Humidity, DBT, WBT & DPT

Q.2 a) A boot strap cooling system of 10 TR Capacity is used in an aeroplane. The ambient air temperature and pressure are 20 °C & 0.85 bar respectively. The pressure of air increases from 0.85 bar to 1 bar due to ramming action of air. The pressure of air discharged from the main compressor is 3 bar. The discharge pressure of air from the auxiliary compressor is 4 bar. The isentropic efficiency of each compressor is 80%, while that of turbine is 85%. The heat exchanger effectiveness for both the heat exchanger is 60%. Assuming ramming action to be isentropic, the required cabin pressure of 0.9 bar and temperature of air leaving the cabin not more than 20 °C, Find: Power required to operate the system, COP of system. 12

b) Explain following Psychrometric Processes with neat sketch.

008

(i) Heating & Humidification. (ii) Cooling & Dehumidification. (iii) Sensible Heating

[Total Marks 80]

(iv) Sensible Cooling

Q.3 a) A Vapour Compression Refrigeration System using R-12 works between -25°C and 40°C as evaporator & condenser temperature respectively. Using P-h chart, Determine;

- I. COP.
- Mass of Refrigerant per TR.
- Piston Displacement per TR using Volumetric Efficiency = 83%.
- Heat Rejected in the Condenser per TR.
- Ideal COP.

12

0.80

b) Enlist the types of Air Cooling Systems. Explain Simple Air Cooling System with T-S diagram, processes involved in the cycle & application.

150.40

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Prasad Yarlagadda, Yun Hae Kim

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The Complete Book of Colleges, 2012 Edition Princeton Review (Firm), 2011-08-15 Presents a comprehensive guide to 1 571 colleges and universities and includes information on academic programs admissions requirements tuition costs housing financial aid campus life organizations athletic programs and student services Wills' Mineral Processing Technology Barry A. Wills, James Finch, 2015-09-01 Wills Mineral Processing Technology An Introduction to the Practical Aspects of Ore Treatment and Mineral Recovery has been the definitive reference for the mineral processing industry for over thirty years This industry standard reference provides practicing engineers and students of mineral processing metallurgy and mining with practical information on all the common techniques used in modern processing installations Each chapter is dedicated to a major processing procedure from underlying principles and technologies to the latest developments in strategies and equipment for processing increasingly complex refractory ores The eighth edition of this classic reference enhances coverage of practical applications via the inclusion of new material focused on meeting the pressing demand for ever greater operational efficiency while addressing the pivotal challenges of waste disposal and environmental remediation Advances in automated mineralogy and analysis and high pressure grinding rolls are given dedicated coverage. The new edition also contains more detailed discussions of comminution efficiency classification modeling flocculation reagents liquid solid separations and beneficiation of phosphate and industrial materials Finally the addition of new examples and solved problems further facilitates the book s pedagogical role in the classroom Connects fundamentals with practical applications to benefit students and practitioners alike Ensures relevance internationally with new material and updates from renowned authorities in the UK Australia and Canada Introduces the latest technologies and incorporates environmental issues to place the subject of mineral processing in a contemporary context addressing concerns of sustainability and cost effectiveness Provides new case studies examples and figures to bring a fresh perspective to the field AsiaSim 2012 - Part III Tianyuan Xiao, Lin Zhang, Minrui Fei, 2012-10-06 The Three Volume Set CCIS 323 324 325 AsiaSim 2012 together with the Two Volume Set CCIS 326 327 ICSC 2012 constitutes the refereed proceedings of the Asia Simulation Conference AsiaSim 2012 and the International Conference on System Simulation ICSC 2012 held in Shanghai China in October 2012 The 267 revised full papers presented were carefully reviewed and selected from 906 submissions. The papers are organized in topical sections on modeling theory and technology modeling and simulation technology on synthesized environment and virtual reality environment pervasive computing and simulation technology embedded computing and simulation technology verification validation and accreditation technology networked modeling and simulation technology modeling and simulation technology of continuous system discrete system hybrid system and intelligent system high performance computing and simulation technology cloud simulation technology modeling and simulation technology of complex system and open complex huge system simulation based acquisition and virtual prototyping engineering technology simulator simulation language and

intelligent simulation system parallel and distributed software CAD CAE CAM CIMS VP VM and VR visualization computing and simulation applications in science and engineering computing and simulation applications in management society and economics computing and simulation applications in life and biomedical engineering computing and simulation applications in energy and environment computing and simulation applications in education computing and simulation applications in military field computing and simulation applications in medical field Frontiers of Mechanical Engineering and Materials Engineering Wen Pei Sung, Jimmy Chih Ming Kao, Ran Chen, 2012-06-14 Selected peer reviewed papers from the 2012 International Conference on Frontiers of Mechanical Engineering and Materials Engineering MEME 2012 July 27 29 2012 HongKong Advances in Mechanical and Materials Technology Kannan Govindan, Harish Kumar, Sanjay Yadav, 2022-01-01 This book presents select papers from the International Conference on Energy Material Sciences and Mechanical Engineering EMSME 2020 The book covers the three core areas of energy material sciences and mechanical engineering The topics covered include non conventional energy resources energy harvesting polymers composites 2D materials systems engineering materials engineering micro machining renewable energy industrial engineering and additive manufacturing This book will be useful to researchers and professionals working in the areas of mechanical and industrial engineering materials applications and energy technology **Robotics in Education** Munir Merdan, Wilfried Lepuschitz, Gottfried Koppensteiner, Richard Balogh, David Obdržálek, 2019-08-06 This proceedings book gathers the latest achievements and trends in research and development in educational robotics from the 10th International Conference on Robotics in Education RiE held in Vienna Austria on April 10 12 2019 It offers valuable methodologies and tools for robotics in education that encourage learning in the fields of science technology engineering arts and mathematics STEAM through the design creation and programming of tangible artifacts for creating personally meaningful objects and addressing real world societal needs It also discusses the introduction of technologies ranging from robotics platforms to programming environments and languages and presents extensive evaluations that highlight the impact of robotics on students interests and competence development The approaches included cover the entire educative range from the elementary school to the Re-engineering Manufacturing for Sustainability Andrew Y. C. university level in both formal and informal settings Nee, Bin Song, Soh-Khim Ong, 2013-04-08 This edited volume presents the proceedings of the 20th CIRP LCE Conference which cover various areas in life cycle engineering such as life cycle design end of life management manufacturing processes manufacturing systems methods and tools for sustainability social sustainability supply chain management remanufacturing Daily Graphic Ransford Tetteh, 2011-02-23 Encyclopedia of Iron, Steel, and Their Alloys (Online Version) Rafael etc Colás, George E. Totten, 2016-01-06 The first of many important works featured in CRC Press Metals and Alloys Encyclopedia Collection the Encyclopedia of Iron Steel and Their Alloys covers all the fundamental theoretical and application related aspects of the metallurgical science engineering and technology of iron steel and their alloys This Five Volume Set addresses

topics such as extractive metallurgy powder metallurgy and processing physical metallurgy production engineering corrosion engineering thermal processing metalworking welding iron and steelmaking heat treating rolling casting hot and cold forming surface finishing and coating crystallography metallography computational metallurgy metal matrix composites intermetallics nano and micro structured metals and alloys nano and micro alloying effects special steels and mining A valuable reference for materials scientists and engineers chemists manufacturers miners researchers and students this must have encyclopedia Provides extensive coverage of properties and recommended practices Includes a wealth of helpful charts nomograms and figures Contains cross referencing for quick and easy search Each entry is written by a subject matter expert and reviewed by an international panel of renowned researchers from academia government and industry Also Available Online This Taylor E mail e reference taylorandfrancis com International Tel 44 0 20 7017 6062 E mail online sales tandf co Blended Learning in Grades 4-12 Catlin R. Tucker, 2012-06-13 Use technology to focus on your students You ve heard about blended learning which mixes online learning with traditional classroom instruction You have the support of your principal the backing of your district and you are ready to take the leap Now what In this step by step guide teacher and education blogger Catlin Tucker outlines the process for integrating online discussion with face to face instruction in a way that is aligned to the Common Core State Standards works for your students and allows you to focus your energy where it is most needed Catlin Tucker will teach you how to Use the online environment to increase engagement and drive higher order thinking Design dynamic online discussion questions Create a safe space online Prepare students for high stakes exams without sacrificing class time Assess online work Personalize learning and differentiate lessons Move toward flipped instruction which shifts the focus of class time from teacher to student With concrete strategies ready to use resources and sample rubrics grounded in the Common Core State Standards Blended Learning in Grades 4 12 is the ideal tool for the busy 21st century teacher looking to create a student centered classroom The Science of Armour Materials Ian Crouch, 2016-09-21 The Science of Armour Materials comprehensively covers the range of armor materials from steels and light alloys through glasses and ceramics to fibers textiles and protective apparel The book also discusses aspects of analytical and numerical modeling as well as laboratory based high strain rate testing and ballistic testing methodologies Each chapter is written from an international perspective including reviews of the current global literature and incorporates case studies that focus upon real life applications research outcomes and lessons learned The threat spectrum is restricted to small arms ammunition high velocity fragments and stab and spike attacks as well as blast loadings Features input from an editor who is an expert in his field Dr Ian Crouch the author of over 80 publications in his field with three patents to his name Provides systematic and comprehensive coverage of armor materials modeling and testing Offers a cross disciplinary approach that brings together expertise in materials science and defense engineering Discusses aspects of analytical and numerical modeling as well as laboratory based high strain rate testing and ballistic testing methodologies **Industrial** 

Instrumentation and Control Systems Prasad Yarlagadda, Yun Hae Kim, 2012-12-13 Selected peer reviewed papers from the 2012 International Conference on Measurement Instrumentation and Automation ICMIA 2012 September 15 16 2012 Guangzhou China Nontraditional Machining Processes J. Paulo Davim, 2013-06-14 Nontraditional machining employs processes that remove material by various methods involving thermal electrical chemical and mechanical energy or even combinations of these Nontraditional Machining Processes covers recent research and development in techniques and processes which focus on achieving high accuracies and good surface finishes parts machined without burrs or residual stresses especially with materials that cannot be machined by conventional methods With applications to the automotive aircraft and mould and die industries Nontraditional Machining Processes explores different aspects and processes through dedicated chapters The seven chapters explore recent research into a range of topics including laser assisted manufacturing abrasive water jet milling and hybrid processes Students and researchers will find the practical examples and new processes useful for both reference and for developing further processes Industry professionals and materials engineers will also find Nontraditional Machining Processes to be a source of ideas and processes for development and industrial application

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Edelmann, Manfred Plöchl, Peter Pfeffer, 2016-12-19 The AVEC symposium is a leading international conference in the fields of vehicle dynamics and advanced vehicle control bringing together scientists and engineers from academia and automotive industry The first symposium was held in 1992 in Yokohama Japan Since then biennial AVEC symposia have been established internationally and have considerably contributed to the progress of technology in automotive research and development In 2016 the 13th International Symposium on Advanced Vehicle Control AVEC 16 was held in Munich Germany from 13th to 16th of September 2016 The symposium was hosted by the Munich University of Applied Sciences AVEC 16 puts a special focus on automatic driving autonomous driving functions and driver assist systems integrated control of interacting control systems controlled suspension systems active wheel torque distribution and vehicle state and parameter estimation 132 papers were presented at the symposium and are published in these proceedings as full paper contributions. The papers review the latest research developments and practical applications in highly relevant areas of vehicle control and may serve as a reference for researchers and engineers **The Teak Genome** Yasodha Ramasamy, Esteban Galeano, Thwe Thwe Win, 2021-09-01 This book is the first comprehensive compilation of knowledge on teak biology ecology clonal forestry clonal registration seed biology and seed orchards The teak genetic diversity the sequenced genome and transcriptomes from different tissues and their implications in modern tree improvement and material selection have been comprehensively discussed The book also presents a narrative on wood characterization wood chemistry modern silviculture growth and modelling and economics of this valued tropical species Altogether the book contains about 200 pages over 16 chapters authored by globally reputed experts on the relevant field in this tropical tree This book is useful to students teachers and scientists and wood based industries are interested in forestry biology seed orchards breeding genetic diversity molecular genetics in vitro culture wood chemistry and structural and functional genomics Advances in Estimation, Navigation, and Spacecraft Control Daniel Choukroun, Yaakov Oshman, Julie Thienel, Moshe Idan, 2015-01-02 This book presents selected papers of the Itzhack Y Bar Itzhack Memorial Sympo sium on Estimation Navigation and Spacecraft Control Itzhack Y Bar Itzhack professor Emeritus of Aerospace Engineering at the Technion Israel Institute of Technology was a prominent and world renowned member of the applied estimation navigation and spacecraft attitude determination communities He touched the lives of many He had a love for life an incredible sense of humor and wisdom that he shared freely with everyone he met To honor Professor Bar Itzhack s memory as well as his numerous seminal professional achievements an international symposium was held in Haifa Israel on October 14 17 2012 under the auspices of the Faculty of Aerospace Engineering at the Technion and the Israeli Association for Automatic Control The book contains 27 selected revised and edited contributed chapters written by eminent international experts The book is organized in three parts 1 Estimation 2 Navigation and 3 Spacecraft Guidance Navigation and Control The volume was prepared as a reference for research scientists and practicing engineers from academy and industry in the fields of estimation navigation and spacecraft GN C **Advanced** 

Manufacturing Processes II Volodymyr Tonkonogyi, Vitalii Ivanov, Justyna Trojanowska, Gennadii Oborskyi, Anatolii Grabchenko, Ivan Pavlenko, Milan Edl, Ivan Kuric, Predrag Dasic, 2021-02-04 This book offers a timely yet comprehensive snapshot of innovative research and developments at the interface between manufacturing materials and mechanical engineering and quality assurance It covers a wide range of manufacturing processes such as cutting grinding assembly and coatings including ultrasonic treatment molding radial isostatic compression ionic plasma deposition volumetric vibration treatment and wear resistance It also highlights the advantages of augmented reality RFID technology reverse engineering optimization heat and mass transfer energy management quality inspection and environmental impact Based on selected papers presented at the Grabchenko's International Conference on Advanced Manufacturing Processes InterPartner 2020 held in Odessa Ukraine on September 8 11 2020 this book offers a timely overview and extensive information on trends and technologies in production planning design engineering advanced materials machining processes process engineering and quality assurance It is also intended to facilitate communication and collaboration between different groups working on similar topics and offer a bridge between academic and industrial researchers Numerical Methods in Geotechnical Engineering IX, Volume 1 Manuel de Matos Fernandes, 2018-06-22 NUMGE 2018 is the ninth in a series of conferences on Numerical Methods in Geotechnical Engineering organized by the ERTC7 under the auspices of the International Society for Soil Mechanics and Geotechnical Engineering ISSMGE The first conference was held in 1986 in Stuttgart Germany and the series continued every four years 1990 Santander Spain 1994 Manchester United Kingdom 1998 Udine Italy 2002 Paris France 2006 Graz Austria 2010 Trondheim Norway 2014 Delft The Netherlands The conference provides a forum for exchange of ideas and discussion on topics related to numerical modelling in geotechnical engineering Both senior and young researchers as well as scientists and engineers from Europe and overseas are invited to attend this conference to share and exchange their knowledge and experiences This work is the first volume of NUMGE 2018

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