# USN

# M.Tech. Degree Examination, Dec.2013/Jan.2014 Advanced Microcontrollers

Time: 3 hrs.

#### Note: Answer any FIVE full questions.

Max. Marks: 100

- a. What is the need for low power embedded system? Explain briefly. (04 Marks)
  b. Briefly explain the different power saving techniques to achieve low power. (06 Marks)
  c. Explain with a neat block disgram, the architecture of MSP430 microcontroller. (10 Marks)
- 2 a. What is meant by emulated instruction as referred to MSP430. Explain at least three emulated instruction with examples and its emulation.

  b. Write a note on the three internal clocks in MSP430. (03 Marks)
  - Explain the different addressing modes used in MSP430 microcontroller with suitable examples. (12 Marks)
- 3 a. With reference to MSP430 microcontroller explain the difference between POR and PUC.
  - b. What is resolution, precision and accuracy with respect to ADC? With a neat block diagram, explain the operation of successive approximation ADC of MSP430. (19 Marks)
  - c. For the circuit shown in Fig.Q.3(c), write a C program for MSP430 to turn ON an LED if the voltage exceeds 1/2 V<sub>cc</sub>. The clock used is internal. (05 Marks)

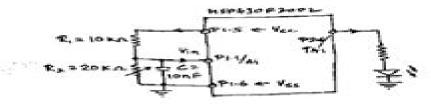


Fig.Q.3(c)

- What are the features of Real Time Clock (RTC) of MSP430? With a neat block diagram of RTC explain the operation in counter mode and calendar mode for MSP430. (10 Marks)
  - With the neat block diagram, explain the non-inverting op amp configuration for MSP430 microcontroller.
- Explain the architecture of CORTEX-M3 processor with a block diagram. (10 Marks)
  - b. Write a short note on the following with respect to ARM CORTEX-M3:
     i) Link register: ii) Program status register.
  - Explain the memory map of CORTEX-M3 processor.

(04 Marks)

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- Write a note on different types of faults with respect to CORTEX M3. Describe the different methods of handling these faults.
  - Describe the context switching with pendable service call.

# **Embedded Systems Vtu Question Papers**

**WJ Hussar** 

#### **Embedded Systems Vtu Question Papers:**

Embedded Systems: Design, Analysis and Verification Gunar Schirner, Marcelo Götz, Achim Rettberg, Mauro C. Zanella, Franz J. Rammig, 2013-06-13 This book constitutes the refereed proceedings of the 4th IFIP TC 10 International Embedded Systems Symposium IESS 2013 held in Paderborn Germany in June 2013 The 22 full revised papers presented together with 8 short papers were carefully reviewed and selected from 42 submissions The papers have been organized in the following topical sections design methodologies non functional aspects of embedded systems verification performance analysis real time systems embedded system applications and real time aspects in distributed systems The book also includes a special chapter dedicated to the BMBF funded ARAMIS project on Automotive Railway and Avionics Multicore Systems

Embedded System Design Peter Marwedel, 2021-01-25 A unique feature of this open access textbook is to provide a comprehensive introduction to the fundamental knowledge in embedded systems with applications in cyber physical systems and the Internet of things It starts with an introduction to the field and a survey of specification models and languages for embedded and cyber physical systems It provides a brief overview of hardware devices used for such systems and presents the essentials of system software for embedded systems including real time operating systems. The author also discusses evaluation and validation techniques for embedded systems and provides an overview of techniques for mapping applications to execution platforms including multi core platforms Embedded systems have to operate under tight constraints and hence the book also contains a selected set of optimization techniques including software optimization techniques The book closes with a brief survey on testing This fourth edition has been updated and revised to reflect new trends and technologies such as the importance of cyber physical systems CPS and the Internet of things IoT the evolution of single core processors to multi core processors and the increased importance of energy efficiency and thermal issues Embedded System Design Lawrence J. Henschen, Julia C. Lee, 2023-09-14 Embedded systems and the Internet of Things are current major efforts in industry and will continue to be mainstream commercial activities for the foreseeable future Embedded Systems Design presents methodologies for designing such systems and discusses major issues both present and future that designers must consider in bringing products with embedded processing to the market It starts from the first step after product proposal behavioral modelling and carries through steps for modelling internal operations The book discusses methods for and issues in designing safe reliable and robust embedded systems It covers the selection of processors and related hardware as well as issues involved in designing the related software Finally the book present issues that will occur in systems designed for the Internet of Things This book is for junior senior MS students in computer science computer engineering and electrical engineering who intend to take jobs in industry designing and implementing embedded systems and Internet of Things applications Focuses on the design of embedded systems starting from product conception through high level modeling and up to the selection of hardware software and network platforms Discusses the trade offs of the various techniques presented

so that engineers will be able to make the best choices for designs for future products Contains a section with three chapters on making designs that are reliable robust and safe Includes a discussion of the two main models for the structure of the Internet of Things as well as the issues engineers will need to take into consideration in designing future IoT applications Uses the design of a bridge control system as a continuing example across most of the chapters in order to illustrate the differences and trade offs of the various techniques Embedded Systems, **Design Principles for Embedded Systems** KCS Murti, 2021-09-20 The book is designed to serve as a textbook for courses offered to graduate and undergraduate students enrolled in electronics and electrical engineering and computer science This book attempts to bridge the gap between electronics and computer science students providing complementary knowledge that is essential for designing an embedded system The book covers key concepts tailored for embedded system design in one place The topics covered in this book are models and architectures Executable Specific Languages SystemC Unified Modeling Language real time systems real time operating systems networked embedded systems Embedded Processor architectures and platforms that are secured and energy efficient A major segment of embedded systems needs hard real time requirements This textbook includes real time concepts including algorithms and real time operating system standards like POSIX threads Embedded systems are mostly distributed and networked for deterministic responses The book covers how to design networked embedded systems with appropriate protocols for real time requirements Each chapter contains 2 3 solved case studies and 10 real world problems as exercises to provide detailed coverage and essential pedagogical tools that make this an ideal textbook for students enrolled in electrical and electronics engineering and computer science programs

Analysis, Architectures and Modelling of Embedded Systems Achim Rettberg, Mauro C. Zanella, Michael Amann, Michael Keckeisen, Franz J. Rammig, 2009-09-04 This book presents the technical program of the International Embedded Systems Symposium IESS 2009 Timely topics techniques and trends in embedded system design are covered by the chapters in this volume including modelling simulation verification test scheduling platforms and processors Particular emphasis is paid to automotive systems and wireless sensor networks Sets of actual case studies in the area of embedded system design are also included Over recent years embedded systems have gained an enormous amount of proce ing power and functionality and now enter numerous application areas due to the fact that many of the formerly external components can now be integrated into a single System on Chip This tendency has resulted in a dramatic reduction in the size and cost of embedded systems As a unique technology the design of embedded systems is an essential element of many innovations Embedded systems meet their performance goals including real time constraints through a combination of special purpose hardware and software components tailored to the system requirements Both the development of new features and the reuse of existing intellectual property components are essential to keeping up with ever more demanding customer requirements Furthermore design complexities are steadily growing with an increasing number of components that have to cooperate

properly Embedded system designers have to cope with multiple goals and constraints simul neously including timing power reliability dependability maintenance packaging and last but not least price **Embedded Systems Specification and Design Languages** Eugenio Villar,2008-05-15 This book is the latest contribution to the Chip Design Languages series and it consists of selected papers presented at the Forum on Specifications and Design Languages FDL 07 in September 2007 The book represents the state of the art in research and practice and it identifies new research directions It highlights the role of specification and modelling languages and presents practical experiences with specification and modelling languages

Embedded Systems and Robotics with Open Source Tools Nilanjan Dey, Amartya Mukherjee, 2018-09-03 Embedded Systems and Robotics with Open Source Tools provides easy to understand and easy to implement guidance for rapid prototype development Designed for readers unfamiliar with advanced computing technologies this highly accessible book Describes several cutting edge open source software and hardware technologies Examines a number of embedded computer systems and their practical applications Includes detailed projects for applying rapid prototype development skills in real time Embedded Systems and Robotics with Open Source Tools effectively demonstrates that with the help of high performance microprocessors microcontrollers and highly optimized algorithms one can develop smarter embedded devices

**Embedded System Applications** Jean-Claude Baron, J.C. Geffroy, G. Motet, 2013-04-17 Embedded systems encompass a variety of hardware and software components which perform specific functions in host systems for example satellites washing machines hand held telephones and automobiles Embedded systems have become increasingly digital with a non digital periphery analog power and therefore both hardware and software codesign are relevant The vast majority of computers manufactured are used in such systems. They are called embedded to distinguish them from standard mainframes workstations and PCs Athough the design of embedded systems has been used in industrial practice for decades the systematic design of such systems has only recently gained increased attention Advances in microelectronics have made possible applications that would have been impossible without an embedded system design Embedded System Applications describes the latest techniques for embedded system design in a variety of applications. This also includes some of the latest software tools for embedded system design Applications of embedded system design in avionics satellites radio astronomy space and control systems are illustrated in separate chapters Finally the book contains chapters related to industrial best practice in embedded system design Embedded System Applications will be of interest to researchers and designers working in the design of embedded systems for industrial applications

Introduction to Embedded Systems: Interfacing to the **Freescale 9S12** Jonathan W. Valvano, 2009-04-23 This book employs a bottom up educational approach with an overall educational objective of allowing students to discover how the computer interacts with its environment through learning basic computer architecture assembly language programming as well as through an introduction to interfacing Developed around the Freescale 9S12 this book describes both the general processes and the specific details involved in microcomputer

simulation In particular detailed case studies are used to illustrate fundamental concepts and laboratory assignments are provided Important Notice Media content referenced within the product description or the product text may not be available in the ebook version Embedded Systems Design Arnold Berger, 2001-12-15 Hardware Software Partitioning Cross Platform Development Firmware Debugging Performance Analysis Testing Integration Get into embedded systems programming with a clear understanding of the development cycle and the specialized aspects of <u>Design</u> Peter Marwedel, 2005 Provides the material for a first course on embedded systems This book aims to provide an overview of embedded system design and to relate the most important topics in embedded system design to each other It aims to help motivate students as well as professors to put more emphasis on education in embedded systems Systems: An Integrated Approach LyLa B. Das, 2012 Embedded Systems An Integrated Approach is exclusively designed for the undergraduate courses in electronics and communication engineering as well as computer science engineering This book is well structured and covers all the important processors and their applications in a sequential manner It begins with a highlight on the building blocks of the embedded systems moves on to discuss the software aspects and new processors and finally concludes with an insightful study of important applications. This book also contains an entire part dedicated to the ARM processor its software requirements and the programming languages Relevant case studies and examples supplement the main discussions in the text Co-verification of Hardware and Software for ARM SoC Design Jason Andrews, 2004-09-04 Hardware software co verification is how to make sure that embedded system software works correctly with the hardware and that the hardware has been properly designed to run the software successfully before large sums are spent on prototypes or manufacturing This is the first book to apply this verification technique to the rapidly growing field of embedded systems on a chip SoC As traditional embedded system design evolves into single chip design embedded engineers must be armed with the necessary information to make educated decisions about which tools and methodology to deploy SoC verification requires a mix of expertise from the disciplines of microprocessor and computer architecture logic design and simulation and C and Assembly language embedded software Until now the relevant information on how it all fits together has not been available Andrews a recognized expert provides in depth information about how co verification really works how to be successful using it and pitfalls to avoid He illustrates these concepts using concrete examples with the ARM core a technology that has the dominant market share in embedded system product design The companion CD ROM contains all source code used in the design examples a searchable e book version and useful design tools The only book on verification for systems on a chip SoC on the market Will save engineers and their companies time and money by showing them how to speed up the testing process while still avoiding costly mistakes Design examples use the ARM core the dominant technology in SoC and all the source code is included on the accompanying CD Rom so engineers can easily use it in their own designs Embedded Systems D. P. Kothari, 2011 So You Wanna Be an Embedded Engineer Lewin Edwards, 2006-08 In this new

highly practical guide expert embedded designer and manager Lewin Edwards answers the guestion How do I become an embedded engineer Embedded professionals agree that there is a treacherous gap between graduating from school and becoming an effective engineer in the workplace and that there are few resources available for newbies to turn to when in need of advice and direction This book provides that much needed guidance for engineers fresh out of school and for the thousands of experienced engineers now migrating into the popular embedded arena This book helps new embedded engineers to get ahead guickly by preparing them for the technical and professional challenges they will face Detailed instructions on how to achieve successful designs using a broad spectrum of different microcontrollers and scripting languages are provided The author shares insights from a lifetime of experience spent in the trenches covering everything from small vs large companies and consultancy work vs salaried positions to which types of training will prove to be the most lucrative investments This book provides an expert s authoritative answers to questions that pop up constantly on Usenet newsgroups and in break rooms all over the world An approachable friendly introduction to working in the world of embedded design Full of design examples using the most common languages and hardware that new embedded engineers will be likely to use every day Answers important basic questions on which are the best products to learn trainings to get and kinds of companies to work for **Embedded Systems** Krzysztof Iniewski, 2012-10-26 Covers the significant embedded computing technologies highlighting their applications in wireless communication and computing power An embedded system is a computer system designed for specific control functions within a larger system often with real time computing constraints It is embedded as part of a complete device often including hardware and mechanical parts Presented in three parts Embedded Systems Hardware Design and Implementation provides readers with an immersive introduction to this rapidly growing segment of the computer industry Acknowledging the fact that embedded systems control many of today s most common devices such as smart phones PC tablets as well as hardware embedded in cars TVs and even refrigerators and heating systems the book starts with a basic introduction to embedded computing systems It hones in on system on a chip SoC multiprocessor system on chip MPSoC and network on chip NoC It then covers on chip integration of software and custom hardware accelerators as well as fabric flexibility custom architectures and the multiple I O standards that facilitate PCB integration Next it focuses on the technologies associated with embedded computing systems going over the basics of field programmable gate array FPGA digital signal processing DSP and application specific integrated circuit ASIC technology architectural support for on chip integration of custom accelerators with processors and O S support for these systems Finally it offers full details on architecture testability and computer aided design CAD support for embedded systems soft processors heterogeneous resources and on chip storage before concluding with coverage of software support in particular O S Linux Embedded Systems Hardware Design and Implementation is an ideal book for design engineers looking to optimize and reduce the size and cost of embedded system products and increase their reliability and performance

Embedded Systems and Applications Hamid R. Arabnia, Leonidas Deligiannidis, George Jandieri, Ashu M. G. Solo, Fernando G. Tinetti, 2015-02-05 Embedded Systems and Applications is a compendium of articles and papers that were presented at ESA 14 an international conference that serves researchers scholars professionals students and academicians Selected topics include Micro Controllers Micro Processors Programming Software Systems and Related Issues Embedded Systems HPC Sensory Devices Network on Chip Systems and Applications Posters Late Breaking Papers and Position Papers **Embedded Systems and Applications** Embedded Systems Design with Platform FPGAs Ronald Sass, Andrew G. Schmidt, 2010-09-10 Embedded Systems Design with Platform FPGAs introduces professional engineers and students alike to system development using Platform FPGAs The focus is on embedded systems but it also serves as a general guide to building custom computing systems The text describes the fundamental technology in terms of hardware software and a set of principles to guide the development of Platform FPGA systems The goal is to show how to systematically and creatively apply these principles to the construction of application specific embedded system architectures There is a strong focus on using free and open source software to increase productivity Each chapter is organized into two parts The white pages describe concepts principles and general knowledge The gray pages provide a technical rendition of the main issues of the chapter and show the concepts applied in practice This includes step by step details for a specific development board and tool chain so that the reader can carry out the same steps on their own Rather than try to demonstrate the concepts on a broad set of tools and boards the text uses a single set of tools Xilinx Platform Studio Linux and GNU throughout and uses a single developer board Xilinx ML 510 for the examples Explains how to use the Platform FPGA to meet complex design requirements and improve product performance Presents both fundamental concepts together with pragmatic step by step instructions for building a system on a Platform FPGA Includes detailed case studies extended real world examples and lab exercises Embedded Systems Rao B. Kanta, 2011

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