

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Embedded System

Semester: Spring

Year : 2014
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

- | | | |
|----|---|-----|
| a) | What is an embedded system? What are the applications of embedded system? | 8 |
| b) | What are Software Design Issues? Explain basic architecture of Software Design Issues. | 7 |
| a) | What is an ASIP? Give two examples where it can be used. Discuss the advantages of an ASIP over single purpose processor. | 7 |
| b) | Distinguish between a combinational and sequential circuit with example. | 8 |
| a) | Explain in detail the three different cache mapping techniques. | 9 |
| b) | Explain the operations of storing and erasing the data in UV-EPROM. | 6 |
| a) | Why an interrupt is important? Discuss the methods to serve interrupts. | 7 |
| b) | What is a process and process control block? Explain various states of a process. | 8 |
| a) | Explain various types of task scheduling techniques in RTOS. | 7 |
| b) | Describe architecture of 8051 Family. | 8 |
| a) | Give an introduction to VHDL and explain the basic structure of a VHDL file with all the types of architecture. | 7 |
| b) | Write a VHDL program to simulate binary adder. | 2×5 |
| a) | Write short notes on: (Any two) | |
| b) | Wireless communication. | |
| c) | Cross compiler and cross assembler. | |
| | VHDL realization of binary subtractor. | |

Level: Bachelor

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hardware description in VHDL.

7. Write short notes on: (Any two)

- a) Daisy-chain Arbitration.
- b) Cross compiler and Debugger.

c) Memory write and Storage Permanence.

Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

1. a) What is an embedded system? Explain the classification of 2+5 embedded system in detail.
- b) Explain the importance of the following processors in embedded 4+4 systems:
 - i. Digital signal processor
 - ii. ASSP.
2. a) Why single purpose processor is required when general purpose 7 processors can execute a variety of programs and are readily available? Give reasons.
- b) How does a programmer view a microprocessor-based embedded 8 system? What are his/her concerns?
3. a) Briefly define each of the following: mask-programmed ROM, 9 PROM, EPROM, EEPROM, flash EEPROM.
- b) Define Cache mapping. Explain set-associative mapping with 1+5 figure.
4. a) Explain the difference between port-based I/O and bus-based I/O. 4+4 Also explain the benefits that an interrupt address table has over fixed and vectored interrupt methods.
- b) What are task states? Describe task scheduling. 2+5
5. a) Differentiate between clock communication and task 4+4 synchronization. Also explain Interrupt processing.
- b) Discuss the instruction set of intel 8051 family microcontroller. 7
6. a) Write a VHDL program for 4-bit Full adder circuit. 7
- b) Discuss the various styles of modeling used in architecture body of 8

POKHARA UNIVERSITY

Level: Bachelor
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Semester: Fall

Year : 2016
Full Marks: 100
Pass Marks: 45
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Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

- a) Define Embedded System? Explain the different characteristics of Embedded System. Give few application areas. 7
- b) Design a synchronous sequential machine that produces output 1 when input sequence is 1011 using JK flip – flop. 8
- a) Design a custom single – purpose processor to calculate GCD between two integers. 8
- b) Explain general purpose processor design with a suitable diagram. 7
- a) Design 4KX8ROMs using 1KX8 ROMs.(1K=1024 words) 7
- b) What is arbitration? Explain the steps used in Daisy - Chain arbitration with a block diagram. 8
- a) Describe the major functions of real – time kernel. 8
- b) Explain Vectored Interrupt with a neat diagram. 7
- a) Define Debugger, Downloader and Cross – Assembler. 7
- b) Write an assembly level program for 8051 to transfer a word "POKHARA" stored in ROM starting at location 250H to RAM starting at locations 50H onward. 8
- a) Explain different modeling styles in VHDL. 7
- b) Write a VHDL code which results an output '1' when a sequence "1101" is detected else an output results a '0'. 8
- Write short notes on: (Any two) 2x5
 - a) DMA
 - b) Clocking communication and Task synchronization
 - c) Combinational logic

POKHARA UNIVERSITY

Level: Bachelor
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Semester: Spring

Year : 2016
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

- a) What is embedded system? Explain the components of embedded hardware. 7
- b) Explain with an example how to optimize custom single purpose processors. 8
- a) Draw the combinational logic design for three inputs a, b & c and two outputs y & z. The output 'y' is such that y is 1 if a is 1 or b & c is 1 and z is 1 if b or c is 1 but not both. 7
- b) How does a programmer view a microprocessor based embedded system? What are his/her concern? 8
- a) Compose $2^{(k+1)} \times 2^n$ memory using $2^k \times n$ memory modules. 7
- b) What is interrupt? Explain the steps used in data transfer using vector interrupt along with its flowchart. 8
- a) Explain any two arbitration techniques that implemented to communicate with peripheral devices from the microprocessor. 7
- b) List out the difference between process and thread? Explain various state of process. 8
- a) Define Real Time Operating System. Differentiate between clocking communication and task synchronization. 7
- b) Explain briefly the architecture of 8051 microcontroller with the aid of block diagram. 8
- a) Give an introduction to VHDL and explain the basic structure of a VHDL file with examples. 7
- b) Write a VHDL program for which output will be 1 when the sequence 101 is detected. 8
- Write short notes on: (Any two) 2x5
 - a) Task, task states and task scheduling
 - b) Cross compiler and cross assembler
 - c) VHDL program to simulate binary adder

प्राप्ति संसाधन विभाग
विश्वविद्यालय, पश्चिम पहाड़ी जिल्हा
NCIT College

POKHARA UNIVERSITY

Level: Bachelor Semester: Fall Year : 2017
 Programme: BE Full Marks: 100
 Course: Embedded Systems Pass Marks: 45
 Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is embedded system? Explain essential components of embedded system? 7
- b) Why single purpose processor is required when general purpose processors can execute a variety of programs and are readily available? Give reasons. 8
2. a) How can you design general purpose processor? Explain with necessary steps & diagram. 7
- b) How does a programmer view a microprocessor based embedded system? what are his/her concern? 8
3. a) Explain Briefly the different cache mapping techniques with suitable diagrams 7
- b) Explain the benefits that an interrupt address table has over the fixed and vectored interrupt methods. 8
4. a) What do you mean by arbitration? Explain the daisy chain and network-oriented arbitration briefly 7
- b) What are task states? Describe task scheduling. 8
5. a) What is semaphore? How semaphore can be used for global resource sharing? 7
- b) Draw the block diagram of 8051 microcontroller also write an assembly level program to interface a seven segment display with 8051 microcontroller. (You can give any example) 8
6. a) Discuss the various styles of modeling used in architecture body of hardware description in VHDL with suitable example 7
- b) Suppose customer 'A' need to detect 1101 by his/her system. Then, design a system, which can fulfill the customer need. Also, explain 8

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The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is an Embedded System? List and define the three main characteristics of embedded systems that distinguish embedded system from other computing systems. 7
- b) What is optimization? Explain optimization of single purpose processor in detail. 8
2. a) Design a processor that calculates the GCD of two numbers. Show the design of datapath only and construct the diagram of controller. 7
- b) How does a programmer view a microprocessor based embedded system? what are his/her concern? 8
3. a) Compose $1K \times 8$ ROM into an $2K \times 16$ ROM. 7
- b) What is Direct Memory Access? Why such circuitry is needed? Explain with its block diagram. 8
4. a) What is Arbitration. Explain Daisy-Chain arbitration. 7
- b) In an RTOS environment different tasks may share same variables and functions. Explain the problems faced due to this type of sharing and also suggest the solutions. 8
5. a) Define Real time operating System? Explain various stages of task. 7
- b) Explain the architecture of 8051 microcontroller with the aid of its block diagram. Also explain the addressing modes of 8051. 8
6. a) Write a VHDL code to simulate 8×1 MUX. 7
- b) Give the VHDL implementation of full adder using both behavioral and structural architecture. And then point out the difference between the two architectures. 8
7. Write short notes on: (Any two) 2x5
 - a) Types of Memory
 - b) Debuggers and downloader
 - c) VHDL code to simulate shift register
- with necessary state transition in system with state diagram & write the VHDL code for those system for testing purpose. 2x5
7. Write short notes on: (Any two) 2x5
 - a) Cross Compiler and Cross Assembler
 - b) Memory-write and Storage Permanence
 - c) VHDL code for 2-bit multiplier

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Embedded System

Semester: Fall

Year : 2015
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

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The figures in the margin indicate full marks.
Attempt all the questions.

- a) Explain the components of embedded system hardware 7
- b) Explain with an example how to optimize custom single purpose processors. 8
- c) Explain in brief about combinational and sequential logic? 7
- d) Define Target and Development processor. Explain three ways to test the program intended for Embedded System. 8
- e) What is Memory Hierarchy. Explain the write ability and Storage performance of Memory devices 7
- f) Sketch the internal design of 8X4 ROM Memory. Explain different types of ROM. 8
- g) Why DMA is used? Explain in detail. 8
- h) Describe wireless communication protocols used in embedded system. 7
- i) List three ways in which an RTOS handles the ISRs in a multitasking environment. 9
- j) Write down the truth table and VHDL code for 3 bit counter. 6
- k) Write an assembly language program based on 8051 to display the number of bottles filled with milk by a bottlers company. Also show the Connection Diagram. 7
- l) Write a VHDL code for octal to binary encoder. 8
- m) Write short notes on: (Any two) 2x:
 - a) Direct mapping
 - b) Cross-Compiler
 - c) Task, task states and task Scheduling

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Embedded System

Semester: Spring Year : 2015
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.
Attempt all the questions.

1. a) Do a washing machine contain an embedded system? Explain relating with the characteristics of embedded system. Write different applications of embedded system. 7
- b) Why decoders and counters are respectively called combinational and sequential logic circuits? Write the design steps for both combinational and sequential logic circuits with conceptual block diagrams. 8
2. a) Design a 3-bit counter that counts the following sequence: 1, 2, 4, 5, 7, 1, 2, etc. This counter has an output "odd" whose value is 1 when the current count value is odd. Use the sequential design technique of the chapter. Start from a state diagram, draw the state table, minimize the logic, and draw the final circuit. 7
- b) What is ASIP? Explain the necessity of ASIP comparing with SPR and GPP. 8
3. a) How can increase the memory capacity and word length of a standard you ROM? 7
- b) What are the main differences between standard I/O and memory mapped I/O? 8
4. a) Why is interrupt important? Compare & contrast interrupt & DMA. 7
- b) Write down the features of real time kernel. What are the differences between stack memory management and heap memory management? 8
5. a) List the ways in which an RTOS handles the ISRs in a multitasking environment. 7
- b) Explain features of 8051 microcontroller. How can the display system be arranged to display two digit numbers? 7

6. a) Write the VHDL code for the 4-bit shift left register. Also draw the circuit. 8
- b) How can you define the VHDL programming? Write down the features of VHDL programming language. 7
7. Write short notes on: (Any two) 2×5
- a) VHDL realization of binary subtractor
 - b) Cross compiler and cross assembler
 - c) Cache memory

Level: Bachelor
Programme: BE
Course: Embedded Systems

Semester: Fall

Year : 2018
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

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Attempt all the questions.

1. a) What is an Embedded system? Justify, how automatic fuel machine is a good example of embedded system?
b) Design a circuit to implement 2-bit gray counter.
2. a) Suppose, you are appointed as an officer in a criminal investigation department, are provided a lot of phone record for analysis. How you will solve this problem & which processor is suitable for this analysis purpose?
b) Explain the programmer view in the embedded system.
3. a) Describe a way to fulfill a requirement of 18 memory locations each 8 bit wide using 16X4 memory chips.
b) Why we need DMA? Explain the working principle of DMA.
4. a) Compare and contrast bus-based I/O and port-based I/O.
b) In an RTOS environment different tasks may share same variables and functions. Explain the problems faced due to this type of sharing and also suggest the solutions.
5. a) Explain memory fragmentation? How problem related to memory fragmentation can be solved in embedded systems?
b) Explain, with necessary diagrams and equations, how a MOSFET can be used as a switch.
6. a) Write an ALP in 8051 to implement seven segment and implement counter that counts two digit hexadecimal number.
b) Write a VHDL program for a 4-bit full adder.
7. Write short notes on: (Any two)
a) Associative cache mapping
b) Control Blocks
c) Structural and Behavioural Model

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE Computer
Course: Embedded System

Semester: Spring

Year : 2018
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

a) Define embedded system. Discuss the various skills required for an embedded system designer. 7

b) Design a synchronous sequential machine that produces output 1 when input sequence is 1101 using T-flip flop. 8

a) Design a custom single-purpose processor that generates Fibonacci series up to n places. Start with a function computing the desired result, translate it into a state diagram, and sketch a probable datapath. 8

b) Discuss basic architecture of general purpose processor with necessary diagram. 7

a) What is memory cache mapping? Explain cache mapping techniques. 8

b) How can you compose memory to increase number and width of words? Design 2KX16 ROMs using 1KX8 ROMs. (1K=1024 words). 7

a) Define arbitration. Explain in brief about daisy chain and network oriented arbitration. 8

b) Define scheduling? Explain various types of task scheduling techniques in RTOS. 7

a) Briefly explain the terms: 7

- i) Cross-assemblers
- ii) Cross-compilers

OR

Sketch a simple MOSFET Model and hence deduce its analytic equation to determine speed, propagation Delay and Fan out. 8

b) Explain task and state of tasks in a system with necessary diagram. 8

6. a) Write an assembly language program for 8051 microcontroller for the following condition. The controller is connected to a single LED and three push buttons PB1, PB2 and PB3 respectively. If PB1 is pressed, the LED blinks 1 time. If PB2 is pressed, the LED blinks 2 times and If PB3 is pressed LED blinks 3 times. Show with necessary connection diagram. 8

b) Write a VHDL program for 4-to-1 MUX. 7

7. Write short notes on: (Any two) 2x5

a) DMA

b) Superscalar and VLIW Architectures.

c) Modelling techniques in VHDL

POKHARA UNIVERSITY

Level: Bachelor

Programme: BE

Course: Embedded System

Semester: Fall

Year : 2019

Full Marks: 100

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Define Embedded System. Explain essential components of Embedded System? 7
- b) Design an overlapping sequence detector for the sequence 1010 8
2. a) Design a sequential circuit to implement 2-bit counter with an input that controls up (increase value) or down (decrease value) count. 8
- b) Explain the firmware development process with necessary block diagram? 7
3. a) Explain different types of RAM with RAM variation. 8
- b) What are methods that can be employed to find the address of interrupt service routine? Discuss a generalized DMA process. 7
4. a) Explain Daisy-chain arbitration in detail. What is the significant of Multilevel bus architecture 8
- b) Define Real time operating System? Explain Round Robin and Pre-emptive Scheduling Policies. 7
5. a) Explain, with necessary diagrams and equations, how a MOSFET can be used as a switch. 8

OR

- What are cross compilers and assemblers? Why do we require such type of compilers and assemblers while designing embedded system?
- b) Write an assembly language program based on 8051 to send data "Hello" through UART (with baud rate of 9600, 8 bit data, no parity, 1 stop bit and no handshake) in every 500 ms using internal timer of the microcontroller. Show the necessary calculation and connection diagram. 7
6. a) Write a VHDL program for which output will be 1 when the sequence 7

1011 is detected considering overlapping condition.

b) Write down the VHDL code for an adder that takes in two 4-bit number and gives their sum as output.

7. Write short notes on: (Any two)

- a) Fan out
- b) Memory Management
- c) Multi-level bus architecture

POKHARA UNIVERSITY

Level: Bachelor
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Semester: Spring

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Attempt all the questions.

1. a) List and define the three main characteristics of embedded system that distinguish such systems from other computing system. 7
- b) State the differences between combinational and sequential circuits? 8
 Describe sequential circuit design process with a suitable example.
2. a) Define datapath and control units with its sub operations. 7
- b) Design a custom single-purpose processor to calculate LCM (least common multiple) between two integers. 8
3. a) Why is cache memory needed? Explain the principle of operation of EPROM with necessary illustrations. 8
- b) Describe how the memory modules can be composed. Use a suitable example describing all the three cases. 7
4. a) What do you understand by interrupt handler? Explain three method by which RTOS handles interrupt. 8
- b) What do you mean by kernel? Describe the types of RT kernel. 7
5. a) Define Debugger, Downloader and Cross-Assembler. 7
- b) Write an assembly language program for 8051 micro controller to display the number from 0 to 9 in a seven segment display so that the number is updated in every 1 sec. User internal timer of the 8051 to generate 1 sec delay. Show necessary connection diagram and calculation. 8
6. a) Write a VHDL program for which output will be 1 when the sequence 1101 is detected considering overlapping condition. 8
- b) Write a program in VHDL implement 8:1 multiplexer. 7
7. Write short notes on: (Any two) 2×5
 - a) Cross compiler and Native Compiler
 - b) DMA
 - c) Types of memory

POKHARA UNIVERSITY

Level: Bachelor
Programme:BE
Course: Embedded Systems

Semester: Fall

Year : 2020
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

7. Write short notes on: (Any two)

- a) Multilevel Bus Architecture
- b) Task and its states
- c) Debugger, Emulator and Profiler

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is an embedded system? What are the main constraints that we should know to develop a firmware in embedded system? 7
- b) Define Combinational and Sequential Circuit. Design a NOR gate using CMOS transistor. 8
2. a) Define Optimization. Explain the different optimization opportunities. 8
- b) What are the key factors a programmer needs to consider when choosing a general-purpose controller? 7
3. a) What do you understand by cache memory? Discuss about cache-replacement policy and cache write techniques. 8
- b) Compose 2Kx16 ROM using 1Kx8 ROM. 7
4. a) Define Arbitration. Explain daisy chain arbitration with necessary diagram. 8
- b) List out the differences between Process and Thread. 7
5. a) What do you understand by TCB in RTOS? What are the information contents of TCB? 8
- b) Write an assembly language program for 8051 microcontroller to blink a LED in every one second. User internal timer interrupt to generate the required delay. Show necessary connection diagram and calculation 7
6. a) Explain different Modeling Styles with an example in VHDL. 9
- b) Write a VHDL code for 4:1 MUX using structural Modeling style. 6

POKHARA UNIVERSITY

Semester: Fall

Level: Bachelor

Year : 2021

Programme: BE

Full Marks: 100

Course: Embedded Systems

Pass Marks: 45

Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) State Moore's Law. Explain different characteristics that differentiate embedded system from other computing. 7
- b) Design a 3-bit gray code counter using JK flip – flop. 8
2. a) Define target and development processor. Explain any three ways of testing the program intended for embedded system. 7
- b) Explain the optimization of single purpose processor in detail. 8
3. a) Combine 2kx4 ROM to get 6kx8 ROM 7
- b) Differentiate interrupt driven I/O using fixed and vectored interrupt. 8
4. a) What are the advantages of interrupt over DMA? Explain the operation of peripheral to memory transfer with DMA 8
- b) What is binary semaphore? Explain the usage of semaphore and mutex with proper example. 7
5. a) Why RTOS are preferred in embedded system? Differentiate between clocking communication and task synchronization. 7
- b) Write an assembly language program for 8051 microcontroller to blink LED 3 times if user sends character 'a' through UART, and blink LED 5 times if user sends 'b' through UART. Show necessary calculation and connection diagram. 8
6. a) Write a program in VHDL implement 4:1 multiplexer. 7
- b) What are the advantages of using VHDL instead of any other HDL? Explain different modelling styles in VHDL with illustration. 8
7. Write short notes on: (Any two) 2×5
 - a) Cross Assemblers
 - b) Set associative Cache mapping
 - c) Arbitration

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Embedded System

Semester: Spring

Year : 2021
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) How embedded design differs from conventional computing? Explain the basic structure of an embedded system. 7
- b) Design 1101 sequence detector (Overlapping) using D flip – flop. 8
2. a) Design custom single-purpose processor to find the greatest among three numbers. Your design should include algorithm, FSDM and data path. 9
- b) Define control unit of general-purpose processor? Explain sub-operations of the instruction cycle. 6
3. a) How can we get 32x12 ROM from 16x8 ROM? 8
- b) What is arbitration? Explain Daisy chain arbitration with necessary diagram. 7
4. a) Explain RTOS task and its states. 8
- b) Define Monolithic, Micro and Exo kernel. 7
5. a) Why RTOS are preferred in embedded system? Differentiate between clocking communication and task synchronization. 7
- b) Write a program for 8051 microcontrollers to provide the on/off time to three traffic lights (Green, Yellow, and Red) and two pedestrian signs (WALK and DON'T WALK), as shown in table below 8

Lights	On Time
1. Green	15 seconds
2. Yellow	5 seconds
3. Red	20 seconds
4. WALK	15 seconds
5. DON'T WALK	25 seconds

The Green and WALK sign should be turned on together, the Red and DON'T WALK sign should be turned on together, and the Yellow and DON'T WALK sign should be turned on together. Use timer to match the turn on time

6. a) Write a VHDL code to simulate 1x8 Demultiplexer. 7
- b) What are the advantages of using VHDL instead of any other HDL? Differentiate between behavioural and structural architecture in VHDL. 8
7. Write short notes on: (Any two) 2x5
 - a) Cross Assemblers
 - b) Address Decoding
 - c) Storage permanence and write ability of memories

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Embedded Systems

Semester: Fall

Year : 2022
Full Marks: 100
Pass Marks: 45
Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

2) What is an embedded System? List and define the three main characteristics of embedded system that distinguish embedded system from other computing systems. 7

b) Design a synchronous sequential machine that produce output when input sequence is 1101 using Rs flip-flop. 8

a) Design a custom single purpose processor that generates Fibonacci series up to n places. Start with a function computing the desired result, translate it into a state diagram, and sketch a probable data path. 9

b) Define Moore's law. Design an XOR gate using CMOS technology. Explain its working with the help of truth table. 6

i. a) Given the following three cache designs, find the one with the best performance by calculating the average cost of access. Show all calculations. 9

i. 4 Kbyte, 8-way set associative cache with a 6% miss rate; cache hit costs one cycle, cache miss costs 12 cycles.

ii. 8 Kbyte, 4-way set-associative cache with a 4% miss rate; cache hit costs two cycles, cache miss costs 12 cycles.

iii. 16 Kbyte, 2-way set-associative cache with a 2% miss rate; cache hit costs three cycles, cache miss costs 12 cycles.

b) Design 4Kx8 ROM using 1Kx8 ROMs. 6

4. a) What do you mean by arbitration? Explain the daisy chain and network oriented arbitration briefly. 8

b) Define task and explain its states. What does TCB contain? Explain. 7

5. a) What is semaphore? How semaphore can be used for global resource sharing? 8

b) Write an assembly language program for 8051 to transfer a word "POKHARA" stored in ROM starting at location 240H to RAM starting at locations 50H onward. 7

6. a) What are different styles of modeling technique used in VHDL? Describe them. 8

b) Write a VHDL code for 8:1 MUX using structural Modeling style. 7

7. Write short notes on: (Any two) 2×5

a) Vector interrupt

b) Cross compiler and cross assembler

c) The Real-time kernel

POKHARA UNIVERSITY

Level: Bachelor

Semester: Spring

Year : 2023

Programme: BE

Full Marks: 100

Course: Embedded System

Pass Marks: 45

Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) What is an embedded System? List and define the three main characteristics of embedded system that distinguish embedded system from other computing systems. 7
- b) Design a soda machine controller, given that a soda costs Rs.60 and your machine accepts notes of Rs 20 only. Draw a black-box view, come up with a state diagram and state table, minimize the logic, and then draw the final circuit. 8
2. a) Design a custom single purpose processor that generates Fibonacci series up to n places. Start with function computing the desired result, translate it into a state diagram, and sketch a probable data-path. 9

OR

Design a custom single purpose processor that calculates GCD of any two number. Start with function computing the desired result, translate it into a state diagram, and sketch a probable data-path.

3. b) What are the considerations of a programmer when looking at a microprocessor-based embedded system? What aspects does a programmer focus on in this scenario? 6
4. i) What is the significance of composing a ROM from other smaller ROMs? Compose a $3K \times 12$ ROM from $1K \times 8$ ROM chips. 7
- ii) Describe the priority arbitration method and provide a comparison with daisy-chain arbitration in terms of their functionalities and benefits. 8
5. i) What is DMA? Differentiate between I/O mapped I/O and Memory mapped I/O. 7
- ii) What is a semaphore? How semaphore can be used for global resource sharing? 8

5. a) What is Real Time Kernel? Differentiate between Monolithic Kernel and Micro Kernel. 7
- b) Provide the internal block diagram of 8051 microcontroller and write a program to display numbers from 0 to 9 on a seven-segment display with 1 second delay. 8

OR

Write an assembly language program for 8051 to transfer a word "POKHARA UNIVERSITY" Stored in ROM starting at location 240H to RAM starting at locations 50H onward.

6. a) Write a VHDL program for 4-bit full adder circuit 7
- b) Discuss the various styles of modelling used in architecture body of hardware description in VHDL. 8
7. Write short notes on: (Any two) 2x5
 - a) Profiler and Debugger
 - b) Cache Write Techniques
 - c) RTOS
 - d) Sequence detector and its application

POKHARA UNIVERSITY

Level: Bachelor
Programme: BE
Course: Embedded Systems

Semester: Fall

Year : 2023
Full Marks: 100
Pass Marks: 45
Time : 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

2. a) What are Embedded Systems? Explain various applications of Embedded Systems. 8
- b) Design the custom single purpose processor (CSPP) to find the Fibonacci series upto n terms. Include blackbox, functionality code, FSM, control unit and datapath design. 7
- a) Design a 2-bit comparator (compares two 2-bit words) with a single output "less-than," using the combinational design technique described in the chapter. Start from a truth table, use K-maps to minimize logic, and draw the final circuit. 8
- b) Provide a definition for FSMD and illustrate an optimized FSMD for the calculation of the Least Common Multiple (LCM). 7
- a) Compose 4kX8 ROMs to implement 8k X 16 memory. 8
- b) Why interrupt-driven pin management is favored over polling? Enumerate the distinctions among Fixed ISR, Vectored Interrupt, and Interrupt Address Table methodologies. 7
4. a) What is RTOS task and task control block? Explain the use of semaphores in task synchronization. 8
- b) Define a Real-Time Kernel and elaborate on its characteristics. Assess the strengths of each of the five types of Real-Time Kernels and determine the most suitable option, justifying the choice. 7
5. a) Discuss in brief about Cross Assembler, Cross Compiler Debuggers and Downloaders. 7
- b) Draw the block diagram of 8051 microcontroller and also write an assembly level code for sending and receiving a character "A" serially with baud rate of 9600. 8
6. a) Implement 4bit binary adder using structural modelling style of VHDL. 8

7. b) What is VHDL? Explain different modelling styles in VHDL design. 7
 7. Write short notes on: (Any two) 2x5
- a) Microprocessor Selection
 - b) OTP ROM
 - c) Task Scheduling