Problem Solving

- C function to SWAP two pointers, draw what happens in the Stack. (ADAS - HMI)
- C function to SWAP two variables. (ADAS - VaS)
- C function to SWAP two arrays. (VaS)
- C function to multiply two integer numbers. (HMI)
- C function to toggle a LED. (ADAS)
- C function to toggle a specific bit in 8-bits variable. (HMI)
- C code to control the led brightness using potentiometer. (ADAS)
- C function to print array elements using pointer. (ADAS)
- C function to copy an array of char (contains repeated numbers) to a new array excluding the repeated numbers using only one loop O(n). (ADAS)
- C function to search for an element in array using binary search both iterative and recursive & mention time complexity. (ADAS)
- C function to get the most repeated element in an array. (ADAS)
- C function returns the average of an array. (ADAS)
- Fibonacci series without recursion. (ADAS)
- C function to count how many times it has been called in the system. (ADAS)
- Show the difference between big endian and little endian with code. (ADAS - HMI)
- C function to find the repeated number in an unsorted array of size 101 elements in an optimized way. (ADAS)
- C function to remove the duplicated numbers in an array. (ADAS – VLS)
- C function to add two numbers, takes two unsigned char as arguments and returns the result in unsigned char and discuss where is the problem and how to solve it. (ADAS - VaS)
- C function to get the max. / min. number in array and its index. (ADAS - VaS)
- C function to check if the number is prime or not. (ADAS - HMI)
- C function to count number of zeros / ones in the binary of an integer. (HMI)
- C function that takes a number. The function will be called many times in the application and it should return the maximum input number from the first call. (HMI)
- C function to return the maximum number of zeros between two ones in the binary of an integer. (VaS)
- C function that returns the sum of the digits of an integer number. Example: 1234, the function should return 1+2+3+4 = 10 (PTS)
- C function to reverse bits of an 8-bit number. Example: 11010010 --> 01001011 (PTS)
- C function to send a frame of 8 bytes and then send the sum of the data in the frame in 2 bytes, then write a function that will receive the frame and check if the data is received correctly. (PTS)
- C function to sort an array using bubble sort algorithm. (HMI)
- C Function to compare between 2 arrays if they contain same elements or not. (VLS)
- If you are given an array {1,2,5,7,1,1,3,1,7}, create a function that takes this array and an integer (like 1 in this case) and return it as follows: {2,5,7,3,7,1,1,1,1}. (VLS)
- C function to sort an array using any algorithm. (VLS)
- C function to reverse a string using both iteration and recursion. (ADAS)
- C function to SWAP the two 4-bits of 8-bits numbers. (VaS)
- C function to return the circular shift of bits of a specific number. (PTS)
- C function to search for a specific string in a stream of data. (HMI)
- C function to clear a specific bit in an integer and another one to set a bit. (ADAS - HMI)
- C function that takes x and y, then returns their summation and multiplication by different ways (3 ways). (HMI)
- If you have two arrays x and y, each array have 5 elements, write a function that swap both arrays in a reversed pattern (x[0] with y[5]). (HMI)
- C function to reverse an array. (ADAS)

- C function to check if a certain bit is set or not in a register (VLS)
- C function to merge 2 arrays using only one for loop. (VLS)
- C function to find the missing element in an array in both cases (array is sorted & array is not sorted). (VLS)
- C function to take 2 variables and return division and remainder. (ADAS)
- C function to take an array and its size and return the member that is a prime number. (VLS)
- C function that returns the cubic root of a given number. (ADAS)
- C function to draw a pyramid. (ADAS - PTS)
- C function to check if the number is a power of 2. (HMI)
- C function to return the maximum number in array and the number of times this maximum number was found in the array. (ADAS)
- C function to calculate the factorial using the recursive and iterative methods. (ADAS)
- C function to sort an array in ascending order. (HMI)
- You have 100 consecutive bytes, The sum of the first 98 is in the last two bytes. Check if the sum is right or not. (PTS)
- C function to count the number of occurrences of a certain number in array. (ADAS)
- C function to convert from little to big endian. (PTS)
- C function to print 2D array.

Embedded Sys. & Computer Architecture

- What is the difference between Startup Code and Bootloader? (ADAS - VLS)
- What do you know about Microcontroller Memory Segments? (ADAS - HMI - VaS)
- What is an embedded system? (ADAS)
- What is a microcontroller and its main components? (ADAS)
- Difference between microcontroller and microprocessor. (ADAS – HMI – VaS - VLS)
- What is the Difference between stack and heap? (ADAS)
- Talk about Memory Types inside the Microcontroller. (ADAS - VaS)
- Can I use the same assembly code for AVR in another architecture and why? (HMI)
- Difference between RAM, EEPROM, FLASH EEPROM. (ADAS)
- What do you know about stack overflow? (ADAS)
- What are the contents of SRAM? (ADAS)
- Differences between register, cache and RAM. (ADAS)
- What is CPU load and how to measure it and what is its unit? (HMI)
- What's IVT? Where is it in memory? (VLS)

Communication Protocols

- What do you know about communication protocols? explain each one into details. UART/I2C/SPI advantages and disadvantages (ADAS)
- Draw the UART Frame (ADAS - HMI)
- What do you know about CAN – LIN? (ADAS - HMI)
- Compare between UART & SPI & I2C. (ADAS – VaS - HMI)
- Write UART send & receive character/byte function with polling and interrupt. (ADAS – VaS – PTS - VLS)
- What is the difference between Full and half duplex communication? (ADAS)
- What is difference between sync. and async. communication? (ADAS)
- Discuss SPI Protocol and Pseudo code for the driver. (HMI)

RTOS

- What is RTOS? (ADAS)
- What do you know about priority inversion? (ADAS)
- Difference between priority inversion and priority inheritance. (ADAS)
- What is the difference between Preemptive and Non-Preemptive Kernels? (ADAS - VLS - HMI)
- Difference between mailboxes, semaphore and mutex. (GEEDS - ADAS – VaS - HMI)
- How to protect a shared resource? (VaS)
- What do you know about kernel and scheduler? (GEEDS - ADAS)
- Difference between general purpose OS and RTOS. (HMI)
- What is a critical section? How to protect it? (VLS - GEEDS)
- Give examples about scheduling algorithms. (ADAS)

General & Embedded C

- C Variables size, scope and lifetime. (ADAS - VLS)
- Difference between static, extern, volatile, and register keywords. (ADAS - VaS)
- Difference between reentrant and non-reentrant function. (ADAS – HMI - VaS)
- Difference between sync. and async. function. (ADAS - VLS)
- Difference between #define and typedef. (ADAS - PTS)
- What do you know about #define? (VaS)
- Why it is not preferred to use recursion in Embedded software? (ADAS)
- Discuss C compilation / build process in details. (ADAS – HMI - VLS)
- Define the DDRB register using #define, why you need to make casting and what is the usage of volatile keyword. (ADAS)
- What do you know about interrupt nesting? (ADAS)
- What do you know about linker file? (ADAS - HMI)
- Usage of #pragma. (ADAS - VaS)
- Usage of inline keyword. (ADAS)
- Difference between if and #if. (ADAS)
- Difference between functions and function-like macros. (HMI - GEEDS - VLS)
- Difference between source and header files. (HMI)
- Difference between constant pointer and pointer to constant variable and how to write both. (HMI)
- Difference between interrupts and polling. (ADAS - HMI)
- What is the error if the function does not have a prototype? (HMI)
- Give examples of linker errors. (HMI)
- What happens when an interrupt occurs in details? (ADAS - VaS – PTS - VLS)
- Compare between types of variables (local, global, static) and where each of them is stored in memory. (VaS - HMI)
- Explain global, constant, local, function argument, constant local..... explain each and which memory section are they allocated into? (HMI)
- What is context switching? (ADAS)
- What is the difference between adding 1 to (ptr to int) and (ptr to void)? (VLS)
- What is the interrupt latency? How to measure it and how to minimize it.? (ADAS - PTS)
- What do you know about preprocessor directives like #if and #ifdef? (ADAS)
- What is the Call Back function? (ADAS)
- Discuss different C errors types. (HMI - VLS)
- Difference between structure and union. (ADAS)
- During which phase are macros processed? (ADAS)
- How to return more than one argument from the function? (VaS)
- What is difference between static and dynamic allocation? (ADAS)
- Can an ISR return value or receive a value? (ADAS)
- What is the NULL pointer and its usage? (ADAS)
- What are the best practices in coding when writing an interrupt? (VLS)
- Difference between calling by value and by reference. (ADAS)
- Difference between dangling pointer, void pointer and wild pointer. (VLS)
- Discuss macros and its usage and write a macro to toggle a pin. (VLS)
- How to create a segment in memory with a special name? (ADAS)
- What is the SW Timeout and how to use it with the polling technique? (PTS)
- Difference between makefile & map file. (ADAS)

Peripherals & Hardware

- Talk about five Microcontroller peripherals. (ADAS)
- How to interface the Temperature sensor with the ADC. (ADAS - HMI – PTS - VLS)
- What do you know about Switch debounce issue? (ADAS)
- C Code to make the LED on every press on the switch. (ADAS)
- Write function to light the LED while pressing the switch. (ADAS)
- Difference between pull up/down. (ADAS)
- Talk about these peripherals and modules: IO PORTS - Interrupts - Timers - Watchdog Timer - Motors - ADC - ICU - UART - SPI - I2C - PWM. (ADAS - VaS – PTS - GEEDS)
- If we have array of LEDs, write a function to roll the LEDS on each press (ADAS)
- Discuss Keypad and LCD interfacing/driver. (HMI - PTS)
- How to use the Microcontroller to interface with LCD? (PTS)
- What do you know about timers and PWM in details? (HMI - VLS - PTS)
- What is the usage of the ICU driver? (HMI)
- C Code Toggle LED inside the ISR of an External Interrupt. (HMI)
- C Code to toggle led every 100ms inside the Timer ISR. (HMI)
- How to control the motor speed with PWM and how to generate it. (PTS)
- How to generate two different PWM signals with different duty cycles from the same timer. first signal Ton = 20ms & Toff = 30ms, second signal Ton = 60ms & Toff = 60ms. (PTS - VLS)
- What do you know about timer modes? (HMI)
- What is different between Timer and Counter? (ADAS)
- Difference between stepper and servo motors. (PTS)
- How to measure the frequency of an input signal. (PTS)
- Describe the ADC, ICU & PWM functionality in details. (GEEDS)
- How to interface with Servo Motor? (GEEDS)
- How to generate a PWM signal and what are its parameters? (HMI - PTS)
- What do you know about ADC? Write the driver using both interrupt and polling. (VLS - VaS)
- How to measure duty cycle of an input signal with/without ICU? (VLS)
- How to generate a PWM signal using both PWM and timer compare mode? (VLS)
- If we have an interrupt that fires every 50ms, and a LED on portA.0, toggle the LED every time the interrupt fires. With adding another LED on portA.1, toggle this LED every 100ms. (HMI)
- C code that takes a number as a parameter which represent the level of a quantity and display this level on the LCD. (PTS)
- How ADC work and how to calculate resolution? (HMI)
- Difference between Timer and Watchdog. (ADAS)
- How to generate PWM signal in non-PWM mode, write pseudocode for ISR. (PTS)

Other

- Talk about your graduation project / other projects mentioned in the CV. (All teams)
- What do you know about the AUTOSAR standard/layers? (ADAS - HMI - VaS)
- What do you know about MISRA Rules? (HMI)
- SDLC in details with examples (mainly waterfall - V-model - Agile concepts). (VaS)
- Difference between DIO and Port Drivers in the AUTOSAR. (VaS)
- Draw the V-Model. (HMI)
- Discuss white box and black box testing techniques. (HMI)
- IQ question: 21 containers, 7 full, 7 half and 7 empty. How to distribute them equally between 3 persons, to make each person have the same number of full, half and empty containers. Hint: you can pour containers into others. (ADAS)