Question Paper

Exam Date & Time: 25-Jul-2022 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

IV SEMESTER B. TECH (COMPUTER SCIENCE AND ENGINEERING)
MAKEUP EXAMINATION, JULY 2022
EMBEDDED SYSTEMS [CSE 2253]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) Write the equivalent instructions for PUSH and POP. Demonstrate the operation of each with appropriate figure and example. What is the type of stack implemented by them? (4)

A)

B) Write an assembly language program to find the parity of a given number using sub-routine. Move the parity to the R0 register. The parity of a binary number indicates whether it contains an odd or even number of ones. Parity will be set 1 if data contains odd number of ones and it will be set 0 if it contains even number of ones. (3)

C) Show the data transfer of the following LDRB instructions with appropriate figures and indicate the number of memory cycle times it takes for data transfer. (3)

LDR R1,=0x80000000

LDR R3,=0xF31E4598

LDR R4,=0x1A2B3D4F

STR R3,[R1]

STR R4,[R1,#4]

LDRB R2,[R1]

LDRB R2,[R1,#1]

LDRB R2,[R1,#2].

2) Write an Embedded C program to read the row number and column number of the key pressed in the 4*4 key matrix and display it in the LCD. Configure ONLY the primary diagonal keys in the key matrix. Display the row number and column number of the key pressed in the LCD using both the lines. Use Port pins 0.4 to 0.9 for LCD and 1.10 to 1.13 for connecting to the rows of the key matrix and 2.0 to 2.3 for connecting to the columns of the key matrix. The row number and column number of the diagonal elements are {1,1}, {2,2}, {3,3} and {4,4}. (5)

A)

Suppose if key pressed is in the third row, third column then the output in LCD should be

Row No=3

Column No=3

Note: 0x80 and 0xC0 are the commands to be passed to the LCD to display characters in the first and second line of the LCD unit respectively. Assume that lcdinit(), lcdputs(char*), clear_ports(), lcdcomdata(int, int), and delay_lcd(int) functions are available in lcd_disp.c. Include lcd_disp.c in your program and there is no need to write the function body of the lcd functions.

B) Write an Embedded C function to produce a delay of 10s using Match Register 0 (MR0) of Timer 0 module. Configure the appropriate register to toggle the value of the match output pin MAT0.0 on match. Assume Timer resolution is 100 milliseconds and PCLK=100MHz. (3)

C) What is a frame with respect to serial communication? Explain the structure of a frame. (2)

3) With a neat diagram of ARM registers and ALU, explain special function registers of ARM (5)

A)

B) Translate the following C code snippet to assembly language instructions and derive the outcome. (3)

```
int r2=1, r1=1, r0=5;

for (r1=1; r1< =r0; r1++)

r2=r2*r1;

r0=r2;
```

C) Write the ARM assembly language instruction format and explain its fields. (2)

4) Explain the steps for setting up, configuring and fetching the result in the software controlled mode and burst mode of Analog to Digital Converter (ADC) in LPC1768. (5)

A)

B) Write Embedded C statements for configuring UART0 in LPC1768 with the following specifications: (3)

1. Length of the word: 6, Number of stop bits: 2, Parity: even parity.

2. Enable both Rx/Tx FIFO operations and reset both Rx/Tx FIFO.

3. If DLest =355, configure Divisor Latch registers.

The structure of FCR and LCR are as follows:

FCR

31:8	7:6	5:4	3	2	1	0
RESERVED	RXTRIGGER	RESERVED	DMA MODE	TX FIFO RESET	RX FIFO RESET	FIFO ENABLE

LCR

31:8	7	6	5:4	3	2	1:0
Reserved	DLAB	Break Control	Parity Select	Parity Enable	Stop Bit Select	Word Length Select

C) What is the mechanism used for handling multiple interrupts in ARM micro controller? Write the significant features of that mechanism. (2)

5) Write an embedded C program for LPC1768 to randomly display a number between 0 and 9 on the first 7 segment display unit using the external interrupt (EINT0) in level triggered mode with negative polarity. Use P0.4 to P0.11 for seven segments a to h respectively and P1.23 to P1.26 for enabling the seven segment display units first to four respectively. (5)

A)

Lookup Table for displaying 0 to 9 is

{0x3F,0x06,0x5B,0x4F,0x66,0x6D,0x7D,0x07,0x7F,0x6F}.

B) Explain the bit configuration of an External Match Register (EMR) in LPC1768 timers with a suitable example. (3)

C) With respect to external interrupts in LPC1768, highlight the importance of EXTINT, EXTMODE and EXTPOLAR registers. (2)

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