**AIN SHAMS UNIVERSITY FACULTY OF** ENGINEERING

***April* 5th, *2022***

**Course Code: CSE411**

Midterm **- Real Time and Embedded Systems Design** The Exam Consists of **4** Questions **in 4 Pages**

**Question 1: (4 marks)**

**A.** Having two tasks, each that **executes** its functionality within a while (1), **what** is/are the downgrade(s**) of** using the Program Counter (PC**)** to switch between the two **tasks?**

**Question 2: (4 marks)**

**Choose the right answer.**

**Which of the following is NOT a part of the Exception frame? (**a. Link register

b. Program counter

Stack pointer

d. PSR

**What is the Register that should be used instead of the Program Counter**

-Downgrades is that while Hocking PC the task executed From it's begining till time slice ends, so that the begining of code repeated

and the Context switch not recaled.

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uty of E

-The register used instead PC is SP stake Pointer of the task Tob

in (TCB).

Task Frome

**B.** State the difference between **soft real-time requirements** and **hard real-time**

**requirements.**

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12

*Time*: *1 Hour*

1339

***Total Marks: 20 Marks***

3

PSA

Unveraity

2

CP PC

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**Which of the** following **can periodically trigger the context switch?** a. Watchdog timer

b) **SysTick** timer

c. Peripheral

**d**. Memory

a**. SP**. PRIMASK, and FAULTMASK registers

b. PRIMASK and FAULTMASK registers

R11, R10, R9, R8, R7, R6, R5, and R4

d. PSR, PC, SP, LR, R12, R3, **R2**, R1, and RO

Task *B*

Task A

TASK C

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**If you are doing context switching manually, which registers that you should manually save** on **the stack by yourself (other than those** saved **by** the **hardware)?**

**c**. Stack pointer

d. Link **register**

**What is the CPU register that hold the address of the next instruction to be executed?** a. PSR

bPC

A

**Question 3**: **(3** marks**)**

2

3

1

In a FreeRTOS project, three short periodic tasks were created **(**Task A, Task B and Task C). Task A, Task B, and Task C are having the periods 1 sec, 2 sec**,** and 3 sec respectively. Their priorities are 2, **3**, and 1, respectively. Sketch tasks timing diagram for the first 5 Seconds. Vertical **axe** is the priority level while the horizontal axe is the time in seconds.

A

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***Total*** *Marks***: *20 Marks***

B

2

***Time***:***-1 Hour***

3

A

5

t (sec)

**2/4**

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A 0,1,2,3,4

3,0,2,4 2013

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DD

64 **int main(** void **)**

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99 100

**101**

**102**

103

104

105

**106**

107

**108**

**Question 4: (9 marks)**

Assume the following snippet of code/application that already had all necessary declarations, inclusions, and prototypes. **In the given table, order the first 9 break points to be hit**, **when GO is pressed**.

}

**void vTask1 void \*pvParameters )**

3

**xTasklHandle );**

**xTaskCreate( vTaskl, NULL,** 240, **NULL**, 2, **xTaskCreate( vTask2**, **NULL, 240**, NULL**, 1, xTask2Handle ); vTaskStartScheduler ()**;

**for(; };**

unsigned **portBASE\_TYPE uxPriority; uxPriority=uxTaskPriorityGet** ( NULL **};**

for(**;;**)

**1**

{

}

**void vTask2 ( void** \*pvParameters)

**unsigned portBASE\_TYPE uxPriority; uxPriority=uxTaskPriorityGet(** NULL**);**

**for(;;)**

1

**}**

**vTaskPrioritySet( xTask2Handle,** (**uxPriority + 1) xTaskCreate( vTask3**, **NULL,** 240, **NULL, 3, NULL**);. **vTaskDelay(**100000**);**

**Course Code: CSE411 Real Time and Embedded Systems Design**

**void vTask3 ( void \*pvParameters >**

**unsigned portBASE\_TYPE uxPriority; uxPriority = uxTaskPriorityGet ( NULL };**

**1**

for**(**;;**)**

**}**

**vTaskPrioritySet( NULL**, **uxPriority** 2 **}**)**;**

**TaskDelay(**100000)**;**

**109**

**110 void vApplicationIdleHook ( void )**

**111**

**112**

**113**

**114** 115

**ulIdleCycleCount++;**

0

**VTaskPrioritySet( xTask1Handle, ( uxPriority + 1 } ); VTaskPrioritySet( NULL**,

**uxPriority 1));**

**vTaskDelay(**100000**);**

79

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93

Q

92

***Total*** *Marks****: 20*** *Marks*

112

·Task 2 Pariority = 1

1: Task 2 Priority=3

*Time:* ***1 Hour***

·Task 1. Parivity = 4

• Task & Pariority =2

@

104

|-|~~ |-~~

81..

1710

**3/4**

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*12*

*6*

105

106

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**1st Break Point Hit 2nd Break Point Hit 3rd Break Point Hit**

79

92

80

**8th Break Point Hit**

93

**6th Break Point Hit**

105

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**7th Break Point Hit**

106

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**9th**

***Time: 1 Hour***

***Total Marks*: *20 Marks***

**4th Break Point Hit 5th Break Point Hit**

104

81

**Break Point Hit**

+12

**4/4**

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