

IT209: Tutorial

1. The ARM processor registers R13, R14, and R15 are architecturally used for special purposes. Which is the correct respective sequence of special purpose registers?
 - A) PC, LR, SP
 - B) LR, PC, SP
 - C) SP, LR, PC
 - D) LR, SP, PC
2. A cache that supports dirty bits to manage the most recently written value to a given memory location in the memory hierarchy is referred to as a
 - A) Write-back cache.
 - B) Write-through cache.
 - C) Set-associative cache.
 - D) Fully-associative cache.

3. What the above program is doing?

```
AREA PROGRAM, CODE, READONLY
ENTRY
    MOV R1, #0X14
    MOVS R2, R1, LSR #0X06
    MOVEQ R1, R1, LSL #0X05
END
```

- A) Shift left 5 bits conditionally when zero is set.
 - B) Shift left 5 bits conditionally when zero is reset.
 - C) Shift right 5 bits conditionally when zero is set.
 - D) Shift right 5 bits conditionally when zero is reset.
4. The given program calculates the largest number of two. Fill in the instruction accordingly to get the correct result.

```
AREA PROGRAM, CODE, READONLY
ENTRY
MAIN  LDR R1, VALUE1
      LDR R2, VALUE2
      CMP R1, R2
      _____
      MOV R1, R2
DONE  STR R1, RESULT
END
```

5. What does I=1 and F=1 in the Program Status Register on reset signify?

6. What function does the given program perform?

```
        AREA PROGRAM, CODE, READONLY
        ENTRY
MAIN    LDR R1, VALUE1
        MVN R1, R1
        STR R1, RESULT
        END
```

7. What will be the content of the register R7 after the execution of the following program?

```
        AREA PROGRAM, CODE, READONLY
        ENTRY
        MOV R6, #10
        MOV R7, #1
LOOP    CMP R6, #0
        MULGT R7, R6, R7
        SUBGT R6, R6, #1
STOP    B STOP
        END
```

- A) 0x00000009
- B) 0x0000000A
- C) 0x00375F00
- D) 0x00000000

8. What will be the content of the register R2 after the execution of the following program?

```
        AREA PROGRAM, CODE, READONLY
        ENTRY
        MOV R0, #0X11
        LSL R1, R0, #1
        LSL R2, R1, #1
        END
```

- A) 0x00000110
- B) 0x00000022
- C) 0x00000101
- D) 0x00001101

9. What will be the output of the following program?

```
AREA PROGRAM, CODE, READONLY
ENTRY
    MOV R0, #4
    MOV R1, #3
    MUL R1, R1, R0
END
```

- A) 12
- B) 0
- C) 4
- D) Error occurs

10. What will be the content of the register R1 and R5 after the execution of the following program?

```
AREA PROGRAM, CODE, READONLY
ENTRY
    LDR R1, #-4
    LDR R5, #-4
    LDR R3, =2
    ASR R1, #7
    LSR R5, #7
END
```

- A) R1 = 0xFFFFFFFF , R5 = 0x01FFFFFF
- B) R1 = 0xFFFFFFFFE , R5 = 0x01FFFFFF
- C) R1 = 0xFFFFFFFF , R5 = 0x02FFFFFF
- D) R1 = 0xFFFFFFFFE , R5 = 0x01EFFFFFF

11. Match the following

Field Mnemonic		Meaning	
A	EQ	P	Signed \geq
B	VS	Q	Negative
C	GT	R	Positive or zero
D	PL	S	Equal
E	MI	T	Overflow

12. Let A and B be two unknown 8-bit 2's complement numbers. We know the results of $A \oplus B$ (A ex-or B) and $A \& B$ (A and B) as shown below. Find $A + B$ (sum).

$A \oplus B = 00110100$

$A \& B = 11001001$

13. Euclid's algorithm for computing the GCD of two positive integers (a,b) can be written as

```
while (a != b) {  
    if (a > b)  
        a = a - b;  
    else  
        b = b - a;  
}
```

Write an equivalent ARM assembly program using only instructions [B(branch) ,CMP(compare), SUB(subtraction)]

NOTE: you can use appropriate conditional code after instruction.

Let's say two numbers are stored in the register R0, R1.

14. Which combination of instructions correctly saves and retrieves register values for a subroutine?

- A) STMDB SP!, {R0-R12, LR}
; Subroutine instructions
LDMIA SP!, {R0-R12, PC}
- B) STMDA LR, {R0-R12, LR}
; Subroutine instructions
LDMFA LR!, {R0-R12, PC}
- C) STMEA LR!, {R0-R12, SP}
; Subroutine instructions
LDMIA LR!, {R0-R12, PC}
- D) STR SP, {R0-R12, LR}
; Subroutine instructions
LDR SP!, {R0-R12, PC}

15. Consider the below subroutine, If initially register R0 has value 7, find the value on register R0 after executing the subroutine.

```

SUBROUTINE    CMP R0, #0
              MOVEQ R0, #1
              MOVEQ PC, LR
              MOV R3, R0
              SUB R0, R0, #1
              BL SUBROUTINE
              MUL R0, R3, R0
              MOV PC, LR

```

- A) 0x13B0
- B) 0x7
- C) 0x0
- D) Code fragment runs into an infinite loop

16. Replace XX in LDM and STM with appropriate suffix from IA, IB, DA and DB such that they execute the corresponding function?

STMFD	STM{XX}
LDMFD	LDM{XX}
STMEA	STM{XX}
LDMEA	LDM{XX}

17. What will be the content of R0 & SP after execution of program? Assume that the DATA is stored at 0x8000.

CODE	R0	SP
LDR R0, =DATA		
LDR SP, =0X4EFC		
LDM R0!, {R2 - R9}		
STM SP, {R7, R2, R6, R8}		
STM SP!, {R9, R3-R5}		
DATA DCD 1, 2, 3, 4, 5, 6, 7, 8		

18. What will be the contents of register R1-R5 and SP after the execution of each instructions? Assume initial values of R1, R2, R3, R4, and R5 are 1, 2, 3, 4, and 5 respectively.

	SP	R1	R2	R3	R4	R5
MOV SP, #0X4000						
STMED SP!, {R1-R5}						
LDMFD SP!, {R1-R5}						
STMFA SP!, {R1-R5}						
LDMEA SP!, {R1-R5}						

19. Which register will be stored at which memory location after executing program? What will be the value of SP at the end of program?

```
AREA PROGRAM, CODE, READONLY
ENTRY
```

```
    LDR SP, =0X4000
    PUSH {R2}
    PUSH {R3}
    PUSH {R7}
    POP {R8}
    POP {R9}
    PUSH {R0}
    PUSH {R8}
```

```
END
```

0X3FF0	0X3FF4	0X3FF8	0X3FFC	0X4000	0X4004	0X4008	0X400C	0X4010

20. What is significance of ^ in below instruction?

```
LDMFD SP!, {R0-R3, PC}^
```

21. The appropriate return addresses are obtained with the help of _____ in case of nested routines.

- A) MAR
- B) MDR
- C) Buffers
- D) Stack-pointers

22. The wrong statement/s regarding interrupts and subroutines among the following is/are _____

- i) The sub-routine and interrupts have a return statement
- ii) Both of them alter the content of the PC
- iii) Both are software oriented
- iv) Both can be initiated by the user

- A) i, ii and iv
- B) ii and iii
- C) iv
- D) iii and iv

23. What is the problem with this code?

```
        AREA PROGRAM, CODE, READONLY
        ENTRY
START    MOV R0, #1
        MOV R1, #3
        BL SUB1
        ADD R0, R0, R1

SUB1     ADD R0, R0, R1
        BL SUB2
        BX LR

SUB2     ADD R0, R0, R1
        BX LR
END
```

24. Explain pre-fetch abort in one sentence.

25. Why the FIQ vector is the last entry in the vector table. Explain in 1-2 sentences.

26. Which of the following trigger an interrupt by executing a special operation which is known as a system call.

- A) Hardware
- B) Software
- C) Kernel
- D) None

27. When the process is returned after an interrupt service _____ should be loaded again.

- I. Register contents
- II. Condition codes
- III. Stack contents
- IV. Return addresses

- A) i,iv
- B) ii,iii and iv
- C) iii,iv
- D) i,ii

28. You run an assembly code and you get error “Undefined Instruction at 80H”. At what address code will jump?

29. Will following code go in infinite loop? Justify.

```
                AREA PROGRAM, CODE, READONLY
                ENTRY
                LDR R1, =0
                B MAIN
                SWI_MAIN
                STMFD SP!, {R0-R12, LR}
                LDR R10, [LR, #-4]
                BIC R10, R10, #0xFF000000
                CMP R10, #01
                BLEQ SWI_ADD
                CMP R10, #02
                BLEQ SWI_MUL
MAIN
                LDR R0, =2
                LDR R1, =2
                LDR R2, =2
                SWI 02
SWI_ADD        BX LR
SWI_MUL        BX LR
                END
```


30. Execution is in which mode at the end of following code?

```
AREA PROGRAM, CODE, READONLY
ENTRY
LDR R0, =0X11
MRS R10, CPSR
AND R10, R10, #0XFFFFFFE0
ORR R10, R10, R0
MSR CPSR_C, R0
END
```