ASSIGNMENT - 08

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① Explain the MOV instruction set provided by ARM. T with example for each.

> This instruction copies N to Rd; where N is a register or immediate value it is useful for setting initial values and transferring data b/w registers.

Syntax: <instruction>{<COND>}{S} Rd, N

MOV - Move a 32 bit value into a register

MOV Rd, N → Rd = N

MVN - Move the NOT of 32 bit value into a register

Rd = ~N

Eg: MOV r_7, r_5 PRE $r_5 = 5$

$r_7 = 8$

MOV r_7, r_5 ; let $r_7 = r_5$

AFTER $r_5 = 5$

$r_7 = 5$.

② Explain the ARM SWAP instruction with an example.

> * It is a special case in load store instruction.
* It swaps the contents of memory with the contents of the register.
* It is an atomic operation. It reads and writes a location in the same bus operation, preventing any other instruction from reading or writing to that location until complete.

Syntax:- SWAP {B} {<cond>} Rd, Rm, [Rn]

SWAP - Swap a word b/w memory and register

temp = mem 32[Rn]

mem 32[Rn] = Rm

Rd = temp

SWP B - Swap a byte b/w memory and register

temp = mem 8[Rn]

mem 8[Rn] = Rm

Rd = temp

Ex:- mem 32 [0x9000] = 0x12345678

r_0 = 0x00000000

r_1 = 0x11112222

r_2 = 0x00009000

SWP $r_0, r_1, [r_2]$

POST mem 32[0x9000] = 0x11112222

r_0 = 0x12345678

r_1 = 0x11112222

r_2 = 0x00009000

(3) Discuss co processor instruction of ARM?

> * Co processor instruction are used to extend instruction set. this include data processing, Register transfer and memory transfer.

* A co-processor can either provide additional computation capability or it used to control the memory sub system including caches and memory management.

Syntax:- CDP{<Cond>} Cp, opcode1, Cd, Cn {opcode2}

<MRC/MCR>{<cond>} Cp, opcode1, Rd, Cn, Cm {opcode2}

<LDC/STC>{<Cond>} Cp, Cd addressing

* CDP (Co-processor data processing) :- performance operation in a Co-processor.
* MRC and MCR - Co processor-register transfer :- Move data to/from co-processor register
* LDC STC -> co processor memory transfer :- Load and store blocks of memory to/from a Co-processor.
* In the Syntax of co-processor instructions.
  → The cp field represents the co-processor number b/w Po and P15
  → the opcode field describes the operation to take place on the coprocessor.
  → the Cn, Cm and Cd field describes registers within the Co-processor.
* The co-processor operations and registers depends on the specific co-processor you are using

Eg:
CP15 register being copied into a general purpose register
MRC P15, 0, r10, C0, C0, 0.

Explain PSR instructions with example

* The ARM instruction set provides two instructions to directly control a program status register.
* The MSR instruction transfers the contents of a register into the CPSr or SPSr
* The MSR instruction transfers the contents of either the CPSr or SPSr into the register.

* Together these instructions are used to read and write the CPSR and SPSR.

Syntax:- MSR {<cond>} Rd, <CPSR/SPSR>

MSR {<cond>} <CPSR/SPSR> - <fields>, Rm

MSR {<cond>} <CPSR/SPSR> - <fields>, # immediate

(5) Define Sensors and actuators

> * An embedded system is in constant interaction with the real world and the controlling functions executed by the embedded system are achieved in accordance with the changes happenings to the real world.

* the changes in system environment or variables are detected by the sensors connected to the input port of the embedded system.

* If the embedded system is designed for any controlling purpose, the system will produce some changes in the controlling variable to bring the controlled variable to the desired value.

* It is achieved through an actuator connected to the output port of the embedded system.

* A sensor is a transducer device that converts energy from one form to another for any measurement or control purpose.

* Eg:- Temperature sensor, magnetic Hall Effect sensor, humidity sensor, etc.

* An actuator is form of transducer device which converts signals to corresponding physical action.

* Actuator acts as an output device.

Eg: stepper motor.

(6) Difference b/w DRAM and SRAM.

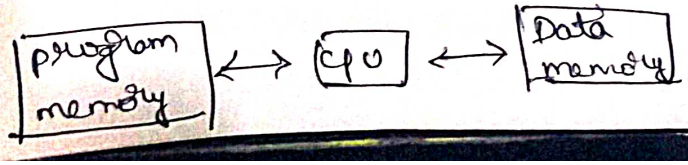
>

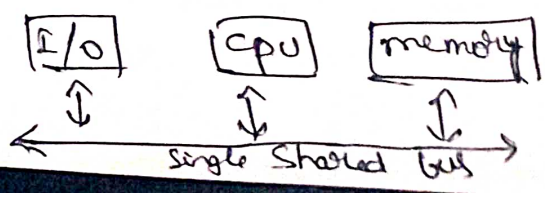
SRAM cell	DRAM cell
* Made up of 6 CMOS transistors	* made up of a MOSFET and a capacitor.
* Doesn't require refreshing	* requires refreshing
* low capacity (less dense)	* high capacity (highly dense)
* More expensive	* less expensive.
* Fast in operation. Typical access time is ~~less~~ 10 ns	* Slow in operation due to refresh requirements time 10 ns.

(7) List the difference b/w Von-neumann and Harvard architecture

>

Harvard architecture	Von-neumann architecture
* Separate buses for instruction and data	* Single shared bus for instruction and data.
* Easier to pipline. So high performance can be achieved	* low performance compared to harvard architecture
* Comparatively high cost	* It is cheaper
* No memory alignment problems	* Allows self modifying codes.

* 

* 

Since data memory and program memory are stored physically in different locations, no chances for accidental corruption of program memory.

Since data memory and program memory are stored physically in the same chip. chances for accidental corruption of program memory.

(8) List out the applications of embedded System.

> * Consumer Electronics!- Camcorders, Cameras, etc.
* Household appliances!- Television, DVD players, washing machine, Refrigerators, microwaves oven etc.
* Telecom!- cellular Telephones, telephone switches, handset multimedia applications etc.
* Computer peripherals!- printers, Scanners, fax machines etc.
* Computer networking systems!- Network routers, switches hubs, firewalls etc.
* HealthCares!- Different kinds of scanners, EEGs, ECGs machines etc.
* measurements and instrumentation!- digital multimeters, digital CRO's, Logic analyzers PLC systems etc.
* Banking and Retail!- Automated teller machines [ATM] and currency counters, point of Sales etc.
* Card readers!- Barcode, Smart Card readers, hand held devices etc.