



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS / B.TECH (IT/EEE) / SEM-4 / CS-404 / 2011**

**2011**

**COMPUTER ORGANIZATION & ARCHITECTURE**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words  
as far as practicable.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following :

$$10 \times 1 = 10$$

- i) Maximum number of directly addressable locations in the memory of a processor having 10 bits wide control bus, 20 bits address bus, and 8 bit data bus in

- |       |                   |
|-------|-------------------|
| a) 1K | b) 2K             |
| c) 1M | d) none of these. |



- ii) The logic circuit in ALU is
  - a) entirely combinational
  - b) entirely sequential
  - c) combinational cum sequential
  - d) none of these.
- iii) When signed numbers are used in binary arithmetic, then which one of the following notations would have unique representation of zero ?
  - a) 1's complements      b) 2's complements
  - c) sign magnitude      d) none of these.
- iv) Which of the following addressing modes is used in the instruction PUSH B ?
  - a) Immediate      b) Register
  - c) Direct      d) Register indirect.
- v) Virtual memory system allows the employment of
  - a) more than address space
  - b) the full address space
  - c) more than hard disk capacity
  - d) none of these.



- vi) In the absolute addressing mode
- a) the address of the operand is inside the instruction
  - b) the register containing the address of the operand is specified inside the instruction
  - c) the location of the operand is implicit
  - d) the operand is inside the instruction.
- vii) Given an 8 bit floating point representation with 4 bits for the fraction part and 4 bits for the exponent part, what is the largest number that can be stored ?
- a) 30730
  - b) 30720
  - c) 20730
  - d) 20720.
- viii) Booth's algorithm for computer arithmetic is used for
- a) multiplication of number in sign magnitude form
  - b) multiplication of number in 2's complement form
  - c) division of number in sign magnitude form
  - d) division of number in 2's complement form.



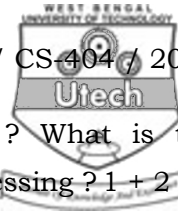
- ix) DMA operations need
- a) switching logic between I/O and system bus
  - b) I/O bus
  - c) special control signals to CPU such as hold and acknowledge
  - d) no CPU control signals.
- x) The conversion of  $(FAFAFB)_{16}$  into octal form is
- a) 76767676
  - b) 76575372
  - c) 76737672
  - d) none of these.
- xi) The branch type instructions in program cause
- a) data hazard
  - b) structural hazard
  - c) control hazard
  - d) none of these.

### GROUP – B

#### ( Short Answer Type Questions )

Answer any *three* of the following.  $3 \times 5 = 15$

2. What is locality of reference ? What is memory mapping ?  
Why is it needed ?  $2 + 1 + 2$
3. Briefly explain the IEEE-754 standard format for floating point representation. How NaN (Not a Number) and Infinity are represented in this standard ?  $3 + 2$



4. What is pipelining ? Why is it required ? What is the difference between pipeline and parallel processing ?  $1 + 2 + 2$
5. a) A digital computer has a common bus system for 16 registers of 32 bits each. The bus is constructed with multiplexers.
- i) How many selection inputs are there in each multiplexer ?
  - ii) What size of multiplexers is needed ?
  - iii) How many multiplexers are there in the bus ?
- b) Why do most computers have a common bus system ?  $3 + 2$
6. What is virtual memory ? Why is it called virtual ? Write the advantage of virtual memory.  $2 + 1 + 2$

**GROUP – C**

**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) Explain Booth's algorithm. Apply Booth's algorithm to multiply two numbers (+14) and (-12). Assume that both the multiplier and the multiplicand to be of 5 bit each.
- b) Give the flowchart for division of two binary numbers and explain.  $10 + 5$



8. a) How does cache memory increase the speed of the processing ? What is hit ratio ?
- b) What is cache mapping ? What is the difference between associative mapping and set-associative mapping ?
- c) A computer has 512 kB cache memory and 2 MB main memory. If the block size is 64 bytes, then find the subfield for
- i) associative mapping
  - ii) direct mapping
  - iii) set-associative mapping.  $2 + 2 + 2 + 3 + 6$
9. a) What do you mean by pipeline processing ?
- b) What are instruction pipeline and arithmetic pipeline ?
- c) Differentiate between vectored and non-vectored interrupts.
- d) Explain pipeline hazards.
- e) Compare RISC with CISC.  $2 + 2 + 2 + 4 + 5$



10. a) What are the advantages of relative addressing mode over direct addressing mode ?
- b) Explain Fynn's classification for multi-processor system.
- c) What are the advantages of carry look ahead adder over ripple carry adder ? Explain.
- d) Explain the different types of addressing modes.

3 + 4 + 3 + 5

11. a) What is instruction cycle ? Draw the Time diagram for memory write operation.
- b) Explain the basic DMA operations for transfer of data between memory and peripherals.
- c) With the help of a neat diagram show the structure of a typical arithmetic pipeline performing  $A * B + C$ .

1 + 4 + 5 + 5

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