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**Fourth Semester B.E. Degree Examination, Dec. 07 / Jan. 08**  
**Computer Organization**

Time: 3 hrs.

Max. Marks:100

**Note : Answer any FIVE full questions.**

- 1 a. Describe the basic functional units of a computer using a schematic. (10 Marks)
- b. Program execution time is defined by  $T = N \cdot S / R$ . A program can be run on a RISC or a CISC computer. Both computers use pipelined instruction execution. Effective value of S in T for RISC machine is 1.2 but it is only 1.5 for CISC machine. Both machines have the same clock rate R. Find the value of N on the CISC machine as a percentage of N for the RISC machine if the time for execution on both the machines is the same. Recalculate the ratio if the clock rate R for the RISC machine is 15% higher than for the CISC machine. (05 Marks)
- c. Explain the following with reference to 2's compliment arithmetic:
  - i) Sign extension
  - ii) Arithmetic overflow. (05 Marks)
- 2 a. Write an assembly language program to add a list of numbers using indirect addressing. (08 Marks)
- b. Explain the concept of stack frames when subroutines are nested. (06 Marks)
- c. The return address of a subroutine could be saved: i) In a processor register ii) In a memory location associated with the call so that a different location is used when the subroutine is called from the different places iii) On a stack.  
Which of the above mentioned possibilities supports subroutine nesting and which supports subroutine recursion? (06 Marks)
- 3 a. What is the need for disabling interrupts? What are the different ways in which interrupts can be disabled and enabled? (08 Marks)
- b. Draw neat timing diagrams and explain: i) Multicycle synchronous bus transfer for a read operation ii) Asynchronous bus transfer for a write operation. (12 Marks)
- 4 a. Three devices A, B and C are connected to the bus of a computer. I/O transfers for all three devices use interrupt control. Interrupt nesting for devices A and B is not allowed. But interrupt requests from C may be accepted while either A or B is being serviced. Suggest different ways in which this can be accomplished in the following cases:
  - i) The computer has one interrupt request line
  - ii) Two interrupt request lines INTR1 and INTR2 are available with INTR1 having higher priority.
 Specify when and how interrupts are enabled and disabled in each case. (05 Marks)
- b. Explain the different phases in the operation of the SCSI bus. (10 Marks)
- c. Draw the block diagram of a 8Mx32 memory using 512Kx8 memory chips. (05 Marks)
- 5 a. Explain the working of a dynamic memory cell. (05 Marks)
- b. Explain how an address generated by the processor gets translated into a main memory address. (10 Marks)
- c. A block-set-associative cache consists of a total of 64 blocks divided into 4-block sets. The main memory contains 4096 blocks each consisting of 128 words.
  - i) How many bits are there in the main memory address?
  - ii) How many bits are there in each of the TAG, SET and WORD fields? (05 Marks)
- 6 a. Explain the circuit arrangement that implements restoring division. (06 Marks)
- b. Let multiplicand  $A = 110101$  and multiplier  $B = 011011$ . Multiply the given signed 2's compliment numbers using booth algorithm. Verify the result using bit pairing of the multiplier. (06 Marks)
- c. Let floating point numbers be represented in a 12-bit format consisting of one bit for the sign, five bits for excess-15 exponent with two end values 0 and 31 signifying 0 and infinity respectively and six bits for the fractional mantissa normalized as in the IEEE format with an implied 1 to the left of the binary point.
  - i) Represent 12.125 in this format.
  - ii) What are the smallest and largest numbers that can be represented in this format? (08 Marks)
- 7 a. Draw a neat block diagram and explain the single bus organization. (10 Marks)
- b. List out the advantages and limitations of a hard-wired control unit. Explain the organization of a micro-programmed control unit. (10 Marks)
- 8 Write notes on:
  - a. USB architecture
  - b. Compact Disk (CD) technology
  - c. Digital camera as an example of an embedded system
  - d. Carry look-ahead addition. (20 Marks)