C0-R4.B4: COMPUTER SYSTEM ARCHITECTURE

NOTE:

1. **Answer question 1 and any FOUR from questions 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Time: 3 Hours **Total Marks: 100**

1.

a) What is the data rate for a magnetic tape device for which the tape density is 1600 bpi and the tape speed is 200 inches per second?
b) What is the difference between a physical record and a logical record?
c) What are the advantages of optical disk storage?
d) Differentiate between a impact and a non impact printer?
e) How does computer know which operation to perform first Read/Write memory or Read/Write I/O?
f) What is an assembler?
g) How a subroutine call is different from branching?

(7x4)

2.

a) What is meant by interleaved memory organization? What are its advantages over normal memory organization?
b) Illustrate the timing diagram of memory write cycle.
c) Define the following characteristics of memory devices:
   i) Storage capacity
   ii) Access mode
   iii) Access time

(6+6+6)

3.

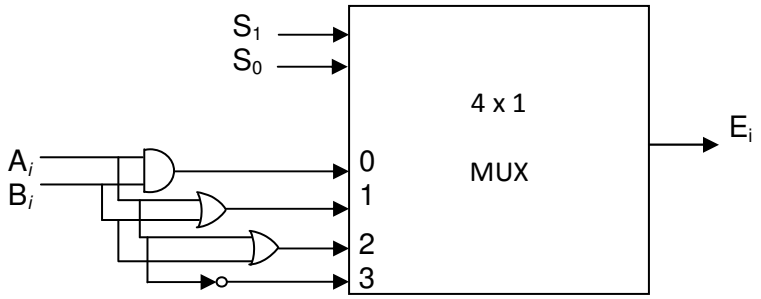
a) For a certain microprocessor, basic memory of 4096 words of 12 bits each is divided into 32 bit pages of 128 words each. Explain the complete addressing mechanism of this memory with the help of suitable diagram. Also specify the page number of following addresses:
   i) C32
   ii) FF3
b) Explain the concept of indexed addressing. What are the associated registers that are used for indexed addressing?
c) List various categories of micro operations. Explain their basic functionality?

(6+6+6)

4.

a) What is a 3 state buffer? Draw its bus diagram and explain its functionality?
b) Calculate the range of numbers for following floating point representation:
   Base ← 2
   Sign ← 1 bit
   Exponent ← 4 bits
   Significand ← 3 bits
   Assume the normalized mantissa representation.

c) Consider the following multiplexer diagram:



Generate the function table and mention logic the logic operations performed by the inputs.

(6+6+6)

5.

a) What are the functions performed by shift micro operations? Explain the concept of circular shift. Mention its applications also.

b) The 8 bit register AR, BR, CR, DR initially have following values:

AR = 11110010
BR = 11111111
CR = 10111001
DR = 11101010

Determine the 8 bit values in each register after the execution of following sequence of micro operations:

AR ← AR + BR
CR ← CR ∧ DR, BR ← BR +1
AR ← AR - CR

c) Make the block diagram of the unit that performs P: R2 ← R1.

(6+6+6)

6.

a) Make the block diagram of 4 bit binary adder subtractor and explain its functioning.

b) Explain the operation performed by each of the micro operations given below:
   i) R2 ← M[AR]
   ii) M[AR] ←R3
   iii) R5 ← M [R5]

c) Derive the circuit for 3 bit parity generator and 4 bit parity checker using an even parity bit.

(6+6+6)

7.

a) What is the significance of parity bit? Make the block diagram of odd parity generator and explain its functioning.

b) Perform the following arithmetic function with the decimal numbers using signed 2's complement representation for negative numbers.
   i) $(-638)_{10} + (+ 785)_{10}$
   ii) $(-638))_{10} – (+185)_{10}$

c) Represent the number $(+ 46.5)_{10}$ as a floating point binary number with 24 bits. The normalized fraction mantissa has 16 bits and the exponent has 8 bits.

d) What is meant by memory transfer instructions? Give example of such type of instructions.

(6+4+4+4)