Roll No: | | | | | | | | | | | | | |

BTECH
(SEM III) THEORY EXAMINATION 2021-22
COMPUTER ORGANIZATION AND ARCHITECTURE

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

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2x10 = 20

Qno	Questions	CO
(a)	List and briefly define the main structural components of a computer.	CO1
(b)	Differentiate between horizontal and vertical microprogramming.	CO3
(c)	Represent the following conditional control statements by two register transfer statements with control functions. If(P=1) then (R1 ←R2) else if (Q=1) then (R1←R3)	CO1
(d)	Design a 4-bit combinational incremental circuit using four full adder circuits.	CO2
(e)	Differentiate between Daisy chaining and centralized parallel arbitration.	CO5
(f)	What is the transfer rate of an eight-track magnetic tape whose speed is 120 inches per second and whose density is 1600 bits per inch?	CO5
(g)	Register A holds the binary values 10011101.What is the register value after arithmetic shift right? Starting from the initial number 10011101, determine the register value after arithmetic shift left, and state whether there is an overflow.	CO2
(h)	What is an Associative memory? What are its advantages and disadvantages?	CO4
(i)	Differentiate between static RAM and Dynamic RAM.	CO4
(j)	What are the different types of instruction formats?	CO3

SECTION B

2. Attempt any *three* of the following: 10x3 = 30

Qno	Questions	CO
(a)	A digital computer has a common bus system for 8 registers of 16 bit each. The bus is constructed using multiplexers. I. How many select input are there in each multiplexer? II. What is the size of multiplexers needed? III. How many multiplexers are there in the bus?	CO1
(b)	Explain destination-initiated transfer using handshaking method.	CO5
(c)	Explain 2-bit by 2-bit Array multiplier. Draw the flowchart for divide operation of two numbers in signed magnitude form.	CO2
(d)	A digital computer has a memory unit of 64K X 16 and a cache memory of 1K words. The cache uses direct mapping with a block size of four words. I. How many bits are there in the tag, index, block, and word fields of the address format? II. How many bits are there in each word of cache, and how they are divided into functions? Include a valid bit. III. How many blocks can the cache accommodate?	CO4
(e)	Explain with neat diagram, the address selection for control memory.	CO3

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SECTION C

3. Attempt any *one* part of the following: 10x1 = 10

Qno	Questions	CO
(a)	A binary floating-point number has seven bits for a biased exponent. The constant used for the bias is 64. I. List the biased representation of all exponents from -64 to +63. II. Show that after addition of two biased exponents, it is necessary to subtract 64 in order to have a biased exponent's sum. III. Show that after subtraction of two biased exponents, it is necessary to add 64 in order to have a biased exponent's difference.	CO2
(b)	Show the multiplication process using Booth algorithm, when the following binary numbers, (+13) x (-15) are multiplied.	CO2

4. Attempt any *one* part of the following: 10x1 = 10

Qno	Questions	CO
(a)	Draw a diagram of a Bus system in which it uses 3 state buffers and a decoder instead of the multiplexers.	CO1
(b)	Explain in detail multiple bus organization with the help of a diagram.	CO1

5. Attempt any *one* part of the following: 10x1 = 10

Qno	Questions	CO
(a)	The logical address space in a computer system consists of 128 segments. Each segment can have up to 32 pages of 4K words each. Physical memory consists of 4K blocks of 4K words each. Formulate the logical and physical address formats.	CO4
(b)	How is the Virtual address mapped into physical address? What are the different methods of writing into cache?	CO4

6. Attempt any *one* part of the following: 10x1 = 10

Qno	Questions	CO
(a)	Explain how the computer buses can be used to communicate with memory and I/O. Also draw the block diagram for CPU-IOP communication.	CO5
(b)	What are the different methods of asynchronous data transfer? Explain in detail.	CO5

7. Attempt any *one* part of the following: 10x1 = 10

Qno	Questions	CO
(a)	Write a program to evaluate arithmetic expression using stack organized computer with 0-address instructions. X = (A-B) * (((C - D * E) / F) / G)	CO3
(b)	List the differences between hardwired and micro programmed control in tabular format. Write the sequence of control steps for the following instruction for single bus architecture. R1 ← R2 * (R3)	CO3