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7. (a) What is meant by an Instruction Set ? What are the elements of an instruction ? How an instruction is represented ? Explain.                      8
- (b) What is a control unit ? What is microprogrammed control unit ? Illustrate its working.                      8

**Unit-IV**

8. (a) What is Pipelining ? When, where and why is it necessary ? Also differentiate between the Instruction pipelining and Arithmetic Pipelining.                      8
- (b) What do you understand by Vector Processing ? State its significance and also enumerate certain applications that demand Vector Processing.                      8
9. Explain the following :
- (a) DMA I/O Technique and its working                      8
- (b) Array Processors                      8

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MCA 1st Semester (MCA 2 Year Programme)  
w.e.f. 2020-21 Examination,  
December-2022

**DIGITAL DESIGN AND COMPUTER  
ARCHITECTURE  
Paper-20MCA21C4**

*Time allowed : 3 hours]                      [Maximum marks : 80*

*Note : • Attempt five questions in all by selecting one question from each unit and Q. No. 1 is compulsory.*

- All questions carry equal marks.

1. Answer the following questions briefly :                      8×2=16
- (a) What is Flynn's computer organization ?
- (b) What is RISC architecture ?
- (c) What are segment registers ?
- (d) What is ripple counter ? State its significance.
- (e) Differentiate between Level-triggering and Edge-triggering.
- (f) Why 2's complement is followed in Binary Arithmetic ?
- (g) What are race-conditions ?
- (h) What is a Johnson-Counter ?

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**Unit-I**

2. (a) Using K-map, obtain the minimal expression in SOP and POS of the following expression. 8  
 $F = \sum_m (0, 1, 2, 3, 4, 5, 7, 8, 9, 10, 12, 13)$   
Implement the same in universal logic.
- (b) Perform the operation  
 $(101 \times 1101)_2 + (ABC.8)_{16} - (75.875)_{10}$  and find out the result in and Octal Number System. 8
3. (a) What is the minimum and minimum floating-point number stored in a 32-bit register assuming 1 bit as sign-bit, 11 bits for exponent and rest for significand ? Provide the complete layout indicating overflow and underflow regions. 8
- (b) What are Universal Gates ? How Universal gates are realized into basic gates ? Illustrate. 4
- (c) What are Excess-3 codes ? Where and how are these helpful ? Illustrate. 4

**Unit-II**

4. (a) What are the characteristics of a good shift register? Design a 4-bit shift register with

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capabilities of storing, shifting (left and right) and parallel load. 8

- (b) What is BCD counter ? How will you implement it using T flip-flops ? Illustrate. 8
5. (a) What is a Ring Counter ? Show that a 3-bit binary counter connected to a  $3 \times 8$  decoder is equivalent to a ring counter with 8 flip-flops. 8
- (b) Design a circuit that compares two bit number X and Y to check if they are equal. The circuit has one output F so that  
 $F = 1$  if  $X = Y$  and  $X = 0$  if  $X \neq Y$  8

**Unit-III**

6. (a) What is Instruction Cycle ? What are various sub-cycles in an Instruction Cycle ? Also outline the steps performed during each of these sub-cycles. 8
- (b) What are 8086 / 8088 Assembly Instructions ? Classify these instructions and give two examples of each. 8

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