

University of Mumbai

Program: Artificial Intelligence and Data Science

Curriculum Scheme: Rev2019

Examination: Second Year Semester: III

Course Code: CSC304 Course Name: Digital Logic and Computer Architecture

Time: 2.5 hour

Max. Marks: 80

| Q1. | Choose the correct option for following questions. All the Questions are compulsory and carry equal marks |
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| 1. | Structural hazard arises due to |
| Option A: | Data conflict |
| Option B: | Resource conflict |
| Option C: | Branch conflict |
| Option D: | Address conflict |
| 2. | What is the value of n in Booth's multiplication of $101 * 1001$? |
| Option A: | 2 |
| Option B: | 3 |
| Option C: | 4 |
| Option D: | 0 |
| 3. | The addressing mode used in an instruction of the form <code>ADD AX, 07h</code> is |
| Option A: | Direct |
| Option B: | Indirect |
| Option C: | Immediate |
| Option D: | Absolute |
| 4. | In the memory hierarchy, as we go down the pyramid, |
| Option A: | Cost per bit decreases, Capacity increases, Access Time increases |
| Option B: | Cost per bit increases, Capacity decreases, Access Time decreases |
| Option C: | Cost per bit increases, Capacity increases, Access Time decreases |
| Option D: | Cost per bit decreases, Capacity decreases, Access Time decreases |
| 5. | In a J-K flip-flop, if $J=K$ the resulting flip-flop is referred to as _____. |
| Option A: | D flip-flop |
| Option B: | S-R flip-flop |
| Option C: | T flip-flop |
| Option D: | S-K flip-flop |

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| 6. | Select true statement from the following. |
| Option A: | USB is a parallel mode of transmission of data and this enables for the fast speeds of data transfers. |
| Option B: | In USB the devices can communicate with each other. |
| Option C: | The type/s of packets sent by the USB is/are Data. |
| Option D: | When the USB is connected to a system, its root hub is connected to the Processor BUS. |
| 7. | Which of the following statements is false? |
| Option A: | Diagonal micro-instructions encoding requires multiple decoders. |
| Option B: | In vertical micro-instructions encoding, more than one control signals cannot be activated at a time. |
| Option C: | Horizontal micro-instructions encoding has a lower cost of implementation. |
| Option D: | On one end of a spectrum, a <i>vertical</i> microinstruction is highly encoded and may look like a simple macroinstruction containing a single opcode field and one or two operand specifiers. |
| 8. | A second factor in locality of reference is the presence of loops in programs. Instructions in a loop, even when they are far apart in spatial terms, are executed repeatedly, resulting in a high frequency of reference to their addresses. This characteristic is referred to as _____. |
| Option A: | Spatial locality. |
| Option B: | temporal locality |
| Option C: | branch locality. |
| Option D: | Equidistant locality |
| 9. | In parallelization, if P is the proportion of a system or program that can be made parallel, and 1-P is the proportion that remains serial, then the maximum speed up that can be achieved using N number of processors is $1/((1P)+(P/N))$. This law is called _____. |
| Option A: | Newton's law |
| Option B: | Ohms law |
| Option C: | Amdahl's law |
| Option D: | Flynn's law |
| 10. | Arbitration does not fail when_____ |
| Option A: | devices on the bus have logic errors |
| Option B: | manufacturing defects |
| Option C: | are driven beyond their design speeds |
| Option D: | more devices compete for the control of the bus |

| Q2. (20 Marks) | Solve any Four out of Six. | 5 marks each |
|---------------------------|--|---------------------|
| A | Explain Booth's Algorithm. Perform multiplication of $(-12 * 5)$ using booth's algorithm. | |
| B | Explain Von Neumann model. What is the role of different registers like IR, PC, MAR, MBR in Von Neumann model. | |
| C | What is flip flop? Write truth table of SR, JK, D, T flip flop. | |
| D | Explain instruction cycle with neat diagram. | |
| E | What is bus arbitration? Explain types of bus arbitration. | |
| F | Explain various pipeline hazards. | |

| Q3. (20 Marks) | Solve any Two Questions out of Three | 10 marks each |
|---------------------------|--|----------------------|
| A | Differentiate between hardwired and microprogrammed control unit and Explain Wilke's Microprogrammed control unit with neat diagram. | |
| B | Consider a cache memory of 16 words. Each block consists of 4 words. Size of the main memory is 256 bytes. Draw associative mapping and Calculate TAG & WORD size. | |
| C | Explain Flynn's classification. | |

| Q4. (20 Marks) | Solve any Two Questions out of Three | 10 marks each |
|---------------------------|---|----------------------|
| A | Draw the flowchart of Restoring Division Algorithm & perform $10/3$ using this Algorithm. | |
| B | What is meaning of delayed branch and branch prediction? Write a difference between them. | |
| C | What are the features of cache memory design? | |