

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2021****Subject Code:3140707****Date:06/09/2021****Subject Name:Computer Organization & Architecture****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

| | | Marks |
|------------|--|-----------|
| Q.1 | (a) State differences between hardwired control unit and microprogrammed control unit. | 03 |
| | (b) Explain register stack and memory stack. | 04 |
| | (c) Show the contents of registers E, AC, BR, QR and SC during the process of multiplying 11111 with 10101. | 07 |
| Q.2 | (a) Write down RTL statements for the fetch and decode operation of basic computer. | 03 |
| | (b) Define pipelining. For arithmetic operation $(A_i * B_i + C_i)$ with a stream of seven numbers ($i=1$ to 7). Specify a pipeline configuration to carry out this task. | 04 |
| | (c) Write a program to evaluate the arithmetic statement: $A*B+C*D+E$ | 07 |
| | i. Using an accumulator type computer. ii. Using a stack organized computer. | |
| | OR | |
| | (c) A non-pipeline system takes 10ns to process a task. The same task can be processed in a six segment pipeline with a clock cycle of 10ns. Determine the speedup ratio of the pipeline for 100 tasks. What is the maximum speed up that can be achieved? | 07 |
| Q.3 | (a) List down six major characteristics of RISC processors. | 03 |
| | (b) Explain how $(r-1)$'s complement is calculated. Calculate 9's complement of 546700. | 04 |
| | (c) Elaborate CPU-IOP communication. | 07 |
| | OR | |
| Q.3 | (a) List and explain major instruction pipeline conflicts. | 03 |
| | (b) Define RTL. Give block diagram and timing diagram of transfer of R1 to R2 when $P=1$. | 04 |
| | (c) Elaborate content addressable memory (CAM). | 07 |
| Q.4 | (a) Explain memory hierarchy in brief. | 03 |
| | (b) Draw and explain flowchart for first pass of assembler. | 04 |
| | (c) Explain using a flowchart how address of control memory is selected in microprogrammed control unit. | 07 |
| | OR | |
| Q.4 | (a) Briefly explain DMA. | 03 |
| | (b) Write assembly level program to subtract two given numbers. | 04 |
| | (c) Write the symbolic microprogram routine for the BSA instruction. Use the microinstruction format of basic microprogrammed control unit. | 07 |

- Q.5** (a) How many AND gates and Adders will be required to multiply a 5 bit number with a 3 bit number? Also say size of adder (bits). How many bits will be there in the result? **03**
- (b) What do you mean by cache memory? Justify the need of cache memory in computer systems. **04**
- (c) Discuss multistage switching network with neat diagrams. **07**
- OR**
- Q.5** (a) Explain the non-restoring methods for dividing two numbers. **03**
- (b) Discuss source-initiated transfer using handshaking in asynchronous data transfer. **04**
- (c) Elaborate cache coherence problem with its solutions. **07**

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