

This question paper contains 4 printed pages]

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S. No. of Question Paper : 5324

Unique Paper Code : 2344000023

Name of the Paper : GE-Computer System Architecture

Name of the Course : B.Sc. (H) Computer Science (NEP-UGCF)

Semester : II

Duration : 3 Hours

Maximum Marks : 90

(Write your Roll No. on the top immediately on receipt of this question paper.)

Question No. 1 is compulsory in Section A.

Attempt any *four* questions from Section B.

Parts of a question should be attempted together.

Section A

1. (a) Convert the following numbers to the indicated bases : 3
 - (i) $(6A7B2.18)_{16} = (?)_2$
 - (ii) $(1100101100111)_2 = (?)_8$.
- (b) Define the following terms : 3
 - (i) Micro-operation
 - (ii) Micro-instruction
 - (iii) Micro-program.
- (c) Name the different modes of transfer used for data transfer between CPU and I/O devices. 3

P.T.O.

- (d) What is a register-reference instruction ? Give any *two* examples of register reference instruction. Name the addressing mode used by these instructions. 3
- (e) A computer uses a memory unit with 32768 words of 48 bits each. Two instruction codes in binary are stored in one word of memory. The instruction has four parts: two bits to specify mode, two bits to specify a processor register, an operation code, and an address part. 3
- (i) Draw the instruction word format and indicate the number of bits in each part.
- (ii) How many addressing modes and number of operations are supported ?
- (f) Define multiplexer. Draw the logic diagram of 8 : 1 multiplexer. 3
- (g) Explain control word. Find the 14-bit control word for the basic computer that must applied to the processor to implement the following micro-operation, for the given operation code : 4
- (i) $R_6 \leftarrow \text{shl } R_1$
- (ii) $R_4 \leftarrow R_3 + R_2$

Operation	Opcode
ADD	10001
Shl	10100

- (h) Perform the following operation on unsigned decimal numbers using the 10's complement : 4
- (i) 1753-8640
- (ii) 6510-2368.

- (i) Draw the truth table and corresponding logic diagram for the following Boolean function : 4

$$F : xy'z + z'y'z + xyz.$$

Section B

2. (a) What is an instruction cycle ? Write the microinstructions for fetch and decode phase of the instruction cycle. 5
- (b) A non-pipeline system takes 50 ns to process a task. A pipelined processor with 6 segment completes pipelined task with a clock cycle of 10 ns. Determine the speedup ratio of the pipeline for 100 tasks. What is the maximum speedup that can be achieved ? 5
- (c) Differentiate RISC and CISC architecture. 5
3. (a) Define SR flip-flop. Give the characteristics and excitation table of SR flip-flop. 5
- (b) Explain cache memory. How the cache memory is different from the primary memory and secondary memory ? 5
- (c) (i) Perform the arithmetic operation $(-10) + (-15)$ with 5 bits binary numbers using signed-2's complement representation. Show if there is any overflow.
- (ii) Write 8's complement of $(624)_8$. 5
4. (a) What is instruction set Completeness ? Name the different types of instructions in instruction set. 5
- (b) Define decoder. Draw the 3 X 8 decoder using two 2 X 4 decoders. 5
- (c) How the data transfer happened between CPU and I/O devices using Programmed I/O method ? 5

5. (a) What is GPU ? How is GPU different from CPU? ? 5
- (b) A two-word instruction is stored at location 300 with its address field at location 301. The address field has the value 400. A processor register R1 contains the number 200. Evaluate the effective address if the addressing mode of the instruction is : 5
- (i) Direct
 - (ii) Immediate
 - (iii) Relative
 - (iv) Register indirect
 - (v) Index with R1 as the index register.
- (c) Given the following Boolean function, F and Don't care condition, d
- $$F(A, B, C, D) = \Sigma (4, 5, 7, 12, 13, 14)$$
- $$d(A, B, C, D) = \Sigma (1, 9, 11, 15)$$
- Simplify the above function in Sum-of-Products (SOP) form using K-map and also draw the logic diagram of simplified function. 5
6. (a) Draw the diagram of 4-bit binary adder-subtractor. Explain its working with help of example. 5
- (b) Differentiate the following terms : 10
- (i) Hardwired Control and micro program control unit
 - (ii) Direct mode and indirect mode
 - (iii) Memory Mapped I/O and isolated I/O
 - (iv) Multicore and multiprocessor
 - (v) RAM and ROM.