JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2025

B.Tech-V Semester (CSE/IT)

COURSE CODE (CREDITS): 18B17CI514 (3) MAX. MARKS: 25

COURSE NAME: Computer Organization and Architecture

COURSE INSTRUCTORS: NTS*, PMI, KTS, SKS MAX. TIME: 1 Hour 30 Min

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

<table>
<tr><th>Q.No</th><th>Question</th><th>CO</th><th>Marks</th></tr>
<tr><td>Q1</td><td>(a) Convert the decimal number 27.625 to IEEE-754 single-precision (32-bit) floating-point format.

(b) A machine has two-way set associative cache with following characteristics.

<table><tr><th>Parameter</th><th>Specification</th></tr><tr><td>Main Memory Size</td><td>4 MB</td></tr><tr><td>Word Size</td><td>1 byte</td></tr><tr><td>Block Size</td><td>64 words</td></tr><tr><td>Cache Size</td><td>8 KB</td></tr><tr><td>Cache Mapping</td><td>Two-Way Set Associative</td></tr></table>
Find the number of SET and TAG bits. Show step-wise calculation.</td><td>3</td><td>[2+5]</td></tr>
<tr><td>Q2</td><td>Consider a system with a write-back cache which is used in a 36-bit CPU. The size of the cache memory is 32 KB. The CPU generates 60% read requests and 40% write requests. The access time of cache and main memory is 60 ns and 800 ns respectively. When a miss occurs in the cache memory, an 8-word data block is transferred from physical memory to cache memory. The hit ratio of read and write operations is 60% and 80% respectively. What is the average memory access time?</td><td>3</td><td>[5]</td></tr>
<tr><td>Q3</td><td>Describe different RAID levels in detail. What is the distinction between parallel access and random access?</td><td>4</td><td>[5+2]</td></tr>
<tr><td>Q4</td><td>(a) Consider a two-way set associative cache memory consisting of 4 blocks. LRU scheme is sued for block replacement. For the given sequence of block addresses [8, 12, 0, 12, 8], calculate total cache misses. Show step-wise calculation.</td><td>4</td><td>[3+3]</td></tr>
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(b) A hard disk has the following parameters:

Parameter	Value
Average seek time	6.0 ms
Rotational speed	10,000 rpm
Data transfer rate	200 MB/s
Sector size	8 KB

i) Compute the average rotational latency (in ms).

ii) Compute the average access time to read a single 8 KB sector (include seek + rotational + transfer time).