Entry Test Sample for PhD in Computer Science Program

1. A language L is undecidable but Turing recognizable. Which of the following is true about L?
   a) L is Co-Turing recogizeable
   b) L is not Co-Turing recogizeable
   c) Compliment of L is decidable
   d) None of the above

2. Let A and B be two languages and A ≤m B. Which of the following is true about A and B?
   a) A and B are decideable
   b) If A is decidable then B is decideable
   c) If B is undecidable then A is undecidable
   d) If A is undecidable then B is undecidable

3. Which of the following is solution of the recurrence relation $T(n) = 7 T(n/7) + n$:
   a) $\Theta(n)$
   b) $\Theta(n^2)$
   c) $\Theta(n \log n)$
   d) $\Theta(n^2 \log n)$

4. What is the total number of nodes in a full binary tree of depth 4?
   a) 15
   b) 16
   c) 30
   d) 31

5. A queue of threads waiting for something inside a critical section is called:
   a) Local Variable
   b) Global Variable
   c) Condition Variable
   d) Semaphore

6. Each process has a separate pool of pages; a page fault in one process can only replace one of this process's:
   a) Pages
   b) Segments
   c) ID
   d) Frames

7. Suppose that cache A, a 16K-byte four-way set associative cache, cache B, a 16K-byte direct-mapped cache, and cache C, a 4K-byte direct-mapped cache are all referenced with an identical address sequence. All caches use a true least-recently used (LRU) replacement policy. Which of the following statements are true?

   i.   A will contain a superset of the data in B
   ii. A will contain a superset of the data in C

iii.   B will contain a superset of the data in A

iv.   B will contain a superset of the data in C

a) i and ii
b) i and iii
c) ii and iii
d) ii and iv

8. Replacing a single memory bank with multiple interleaved memory banks has which of the following effects?

a) Increases latency
b) Increases bandwidth
c) Increases reliability
d) Decreases latency

9. Y2K bug belongs to which of the following categories of defects?
a) Errors of commission
b) Errors of omission
c) Errors of clarity and ambiguity
d) Errors of speed or capacity

10. Which of the following application uses UDP as its transport protocol?
a) SNMP
b) SMTP
c) FTP
d) HTTP