

Five Year Integrated M.Sc. Examination, 2019

Semester - VIII

Course: COMP-4-8-1

(Advanced Computer Science)

Time: Four Hours

Full Marks: 80

Questions are of value as indicated in the margin.

Answer *any five* questions.

1. What are the main advantages of Optical Fiber (OF) as communication medium and which OF transmission bands are used for this purpose? Differentiate between Step index fiber and Graded Index fiber. What is V-number of an optical fiber and how it is related to “mode” of signal propagation within the fiber? What are the intra-modal and inter-modal dispersion losses in fibers? 5+3+5+3
2. What are the three steps of stepwise refinement process in program development? Describe and differentiate between top-down and bottom-up approaches in modular program development. What kind of code structures is allowed and which other types are discouraged in structured programming style? Elucidate your answer through pseudo/language program fragments. 5+5+6
3. Describe with examples, Sequence-Selection-Iteration in any Structured Programming language. What are Selection-Iteration constructs available in ‘bash’ shell? Explain the following shell code and write down the output: 5+5+6

```
#!/bin/sh
a=0
while [“$a” -lt 10] #this is loop1
do
b= “$a”
while [“$b” -ge 0] #this is loop2
do
echo -n “$b”
b=`expr $b - 1`
done
echo a=`expr $a + 1`
done
```
4. a) Explain the basic idea of binary search through a (pseudocode) algorithm. For input size of n elements, carry out the complexity analysis of your algorithm. 8
b) What is the role of “pivot element” and how it is picked up in quick sort? Write down your algorithm and its complexity analysis. 8
5. Whether the lower bound of complexity for simple sorting depends on number of swaps? Justify your answer. Write pseudo-code for Insertion sort and explain that it is an in-place and stable sort. What is the average complexity of this algorithm and under what situation it could be $O(N)$? 5+6+5
6. Describe ‘array’ as statically typed data. What are the main disadvantages or limitations of using array as a data structure? Describe ‘linked list’ as an improvement over ‘array’ and write code for its ‘node’ as struct data-type of C language. What is the role of malloc() and free() memory functions in this context? 4+3+5+4

P.T.O.

7. Describe 'linux' as an example of monolithic kernel and write down the six steps of its booting process. In the context of linux processes, what is the role of fork(), exec(), wait() and exit() system calls? What is 'Copy-on-write technique' and vfork() for process creation? Justify the statement that in linux, "every process consists of at least one thread." 6+4+4+2

8. Write short notes on *any four*:

4x4

- a) DWDM network components
 - b) Primitive data structures
 - c) Kernel threads,
 - d) Process descriptor in Linux
 - e) Pointers for 'call by reference'
 - f) Stack
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