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**University Examinations 2014/2015**

THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY, BACHELOR OF SCIENCE IN COMPUTER TECHNOLOGY AND BACHELOR OF SCIENCE IN COMPUTER SCIENCE

**CCS 3326: DESIGN AND ANALYSIS ALGORITHMS**

**DATE: OCTOBER 2015 TIME: 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Briefly describe the following terms as used with analysis of algorithms:
2. Algorithm correctness.
3. Algorithms complexity.
4. Recursion.
5. Program step.
6. Performance measurement. (10 Marks)
7. Distinguish between an optimization problem and a non-optimization problem, giving an example in each case. (4 Marks)
8. State and briefly describe the three asymptotic notations used in algorithm complexity analysis. (6 Marks)
9. Briefly describe the divide and conquer algorithm design technique, giving the characteristics of the problem that may be solved by this approach. (4 Marks)
10. Briefly describe the brute force algorithms design strategy. (2 Marks)
11. Outline two areas of application of the brute force algorithm design approach, giving reasons why brute force is the most appropriate in each case. (4 Marks)

**QUESTION TWO (20 MARKS)**

1. Consider the 3x3 puzzle below. Use branch and bound to determine the optimal solution to the puzzle. (10 Marks)

|  |  |  |
| --- | --- | --- |
| 1 | 3 | 4 |
| 6 | 2 | 8 |
| 7 | 5 |  |

1. Give two differences between dynamic programming and greedy algorithm design approaches. Where necessary, use an example to illustrate. (4 Marks)
2. Outline the three conditions that are necessary for a problem to solved using recursion, giving an example in each case. (6 Marks)

**QUESTION THREE (20 MARKS)**

1. Using an example to illustrate, describe the application of the prim’s algorithm in generating the minimum spanning tree for a graph. (8 Marks)
2. State and briefly describe six issues that influence algorithms design. (12 Marks)

**QUESTION FOUR (20 MARKS)**

1. Describe the job allocation problem and show how dynamic programming approach may be used in solving the problem. Use an example to illustrate. (10 Marks)
2. Give one advantage and one disadvantage of greedy algorithms as compared with other algorithm design strategies. (4 Marks)
3. Briefly describe any three characteristics of a good algorithm. (6 Marks)

**QUESTION FIVE (20 MARKS)**

1. Backtracking algorithm design strategy is said to be an improvement of the greedy approach to ensure that an optimal solution is obtained every time.
2. Describing the backtracking algorithm design approach. (4 Marks)
3. Give two similarities between backtracking and greedy approaches (4 Marks)
4. Give two differences between backtracking and greedy approaches (4 Marks)
5. Describe the following concepts as used with optimization problems.
6. Bounding function. (2 Marks)
7. Feasibility function. (2 Marks)
8. Solution function. (2 Marks)
9. Candidate set. (2 Marks)