## B.E. Information Technology Fifth Semester IT505 - Design Analysis of Algorithms

| P. P<br>Tim | Pages :<br>ne : Thr | 2GUG/W/18/164ree Hours $* 1 2 8 9 *$ Max. Marks : 8   | <b>GUG/W/18/1640</b><br>Max. Marks : 80 |  |
|-------------|---------------------|---|---|--|
|             | Note                | <ol> <li>Same answer book must be used for all questions.</li> <li>All questions carry equal marks.</li> <li>Due credit will be given to neatness and adequate dimensions.</li> <li>Assume suitable data wherever necessary.</li> <li>Illustrate your answers wherever necessary with the help of neat sketches.</li> </ol> |   |  |
| 1.          | a)                  | Describe Analysis of Algorithms. Discuss Time and space complexity.   | 8                                       |  |
|             | b)                  | Solve the recurrence $T(n) = 2T(n / 2) + n$ by substitution method.   | 8                                       |  |
|             |                     | OR  |   |  |
| 2.          | a)                  | Solve the following recurrence using master method :<br>i) $T(n) = 4T (n/3) + n^2$<br>ii) $T(n) = 8T(n/2) + 3n^3$ .   | 8                                       |  |
|             | b)                  | Solve the following recursion<br>$T(n) = T\left(\frac{n}{2}\right) + T\left(\frac{n}{4}\right) + T\left(\frac{n}{8}\right) + n$ by recursion tree method.   | 8                                       |  |
| 3.          | a)                  | Consider following list of elements as 50, 40, 20, 70, 15, 35, 20, 60 sort the above list using merge sort.   | 8                                       |  |
|             | b)                  | What do you mean by analysis of an algorithm ? Write on algorithm for Binary search and analyse it.   | 8                                       |  |
|             |                     | OR  |   |  |
| 4.          | a)                  | Let $n = 4(P_1, P_2, P_3, P_4) = (100, 10, 15, 27)$ and $(d_1, d_2, d_3, d_4) = (2, 1, 2, 1)$ where $P_1$ are profits on processes or job and di are dead line of completion find the optimal schedule.   | 8                                       |  |
|             | b)                  | Consider 5 items along their respective weights and values<br>$I = (I_1, I_2, I_3, I_4, I_5)$<br>W = (5, 10, 20, 30, 40)<br>V = (30, 20, 100, 90, 160)<br>The capacity of knapsack W = 60. Find the solution to the knapsack problem.   | 8                                       |  |
| 5.          | a)                  | Write short note on travelling salesman problem.  | 8                                       |  |
|             | b)                  | Write any algorithm to find all-pair shortest path. Derive its complexity.  | 8                                       |  |

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| 6.  | a) | What is dynamic programming ? Explain your answer with an example.  | 8 |
|-----|----|---|---|
|     | b) | Determine the LCS of (1, 0, 0, 1, 0, 1, 0, 1) and (0, 1, 0, 1, 1, 0, 1, 1, 0)   | 8 |
| 7.  | a) | Discuss Backtracking technique. Given three types of items with the following respective weights and values $T = (T_1, T_2, T_3) W_i = (1, 4, 5) V_i = (4, 5, 6)$ . | 8 |
|     | b) | <ul><li>Write short note on the following :</li><li>i) Graph coloring</li><li>ii) Hamiltonian cycle.</li></ul>  | 8 |
|     |    | OR  |   |
| 8.  | a) | Give a set = $(1, 3, 4, 5)$ and X = 8, we have to find subset sum using back tracking approach.   | 8 |
|     | b) | <ul> <li>Find all the possible solutions for the -</li> <li>i) 4 x 4 chess board 4 Queens problem</li> <li>ii) 8 x 8 chess board, 8 Queens problem</li> </ul>       | 8 |
| 9.  | a) | Explain Np hard and Np complete problems and also define the polynomial time problems and write a procedure to solve Np - problems.                                 | 8 |
|     | b) | Describe the Max-Clique problem with example.   | 8 |
|     |    | OR  |   |
| 10. | a) | Discuss deterministic and non-deterministic computations with example.  | 8 |
|     | b) | Write a short note on SAT - Independent and Set - 3VC.  | 8 |
|     |    | *****   |   |