

**Tribhuvan University**  
**Institute of Science and Technology**  
**2069**

Bachelor Level/ Third Year/ Fifth Semester/ Science  
Computer Science and Information Technology (CSc. 303)  
**(Design and Analysis of Algorithm)**

Full Marks: 80  
Pass Marks: 32  
Time: 3 hours

*Candidates are required to give their answers in their own words as far as practicable.  
The figures in the margin indicate full marks.*

**Attempt all the questions.**

1. Use RAM model to estimate the big-oh of the running time for following code segment

```
for(i=1 ; i<n ; i++){  
  small pos = i ;  
  smallest = Array [small pos] ;  
  for (j=i+1 ; j<=n ; j++) {  
    if (Array [j] < smallest){  
      small pos = j;  
      smallest = Array [small pos];  
    }  
  }  
  Array [small pos] = Array[i]  
  Array [i] = smallest;  
} (8)
```

2. What do you mean by recurrence relation? Estimate the running time of algorithm given by following

recurrence relations using master method.

a.  $T(n) = 4T(n/2) + n^3$

b.  $T(n) = 2T(n/2) + n$

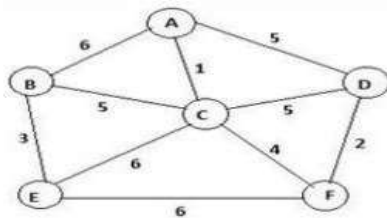
c.  $T(n) = 3T(n/4) + n \log n$  (8)

3. Explain the quick sort algorithm with its complexity analysis. How randomized quick sort works efficiently even for worst case. (6+2)

4. Define order statistics. Write an algorithm that is able to select  $i$ th largest element from an un-ordered list in linear time and analyzer for its complexity. (2+6)

5. Sketch the Prim's algorithm for computing MST of a graph and analyze its complexity. Also trace the

algorithm for the following graph. (2+6)



6. Give the job sequencing algorithm with deadlines. You have given 5 jobs with profit  $p_i$  and deadline  $d_i$  as

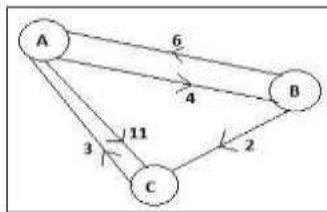
job  $i = \{ 1, 2, 3, 4, 5 \}$

$p_i = \{ 20, 10, 5, 15, 1 \}$

$d_i = \{ 2, 1, 3, 2, 3 \}$

Find the optimal job lists that can be executed in sequence within their deadlines so as to maximize the profits. (4+4)

7. Explain and analyze the Floyd's warshall algorithm for all pair shortest path problem. Trace the algorithm for the following graph. (4+4)



8. What do you mean by left turn and right turn for given three points in 2D? Explain the method for computing the intersection of two line segments efficiently. (2+6)

9. Explain about Class P, Class NP and NP – Complete with suitable examples. (8)

10. Explain the Gram's scan algorithm with example to compute the convex hull of the set of points in 2D. (8)