Roll No. | | | | | | | | | | | | | **Total No. of Pages : 03**

Total No. of Questions : 09

MCA (Sem.–5)

DESIGN AND ANALYSIS OF ALGORITHMS

Subject Code : MCA-502

M.Code : 74382

Date of Examination : 14-12-22

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTIONS-A, B, C & D contains TWO questions each carrying TEN marks each and students has to attempt any ONE question from each SECTION.**
2. **SECTION-E is COMPULSORY consisting of TEN questions carrying TWENTY marks in all.**

SECTION-A

1. Build a max-heap on an array containing the elements: 5, 2, 7, 1, 9, 10, 8, 15, 3, 17.
2. Answer the following :
   a) Give the infix expression of the following prefix expression:

      * - + A B C D

   b) Explain the concept of binary search trees. How does the height of a binary search tree affect its performance? Explain in detail.

SECTION B

3. Answer the following :
   a) What is the running time of the following function:

```
void function (int n){
int i=l, s=l;
while(s<=n) {
i++; s=s+i;
printf("*");!
}
}
```

   b) Find the complexity of the function given below :

```
void function (int n){
```

```
int i,count=0;
for(i=l;i*i<=n;i++)
count++;
}
```

4. Answer the following :

   a) Solve the recurrence:

   $T(n) = C+3T(n-l)$, if $n > 1$

   $T(n) = C$, otherwise

   b) Rank the following functions by order of growth:

   $7n$, 2^n, $10n\log n$, $4n^3$, $5n^2$, $2\log n$

SECTION-C

5. Sort the following elements in increasing order using quick-sort algorithm

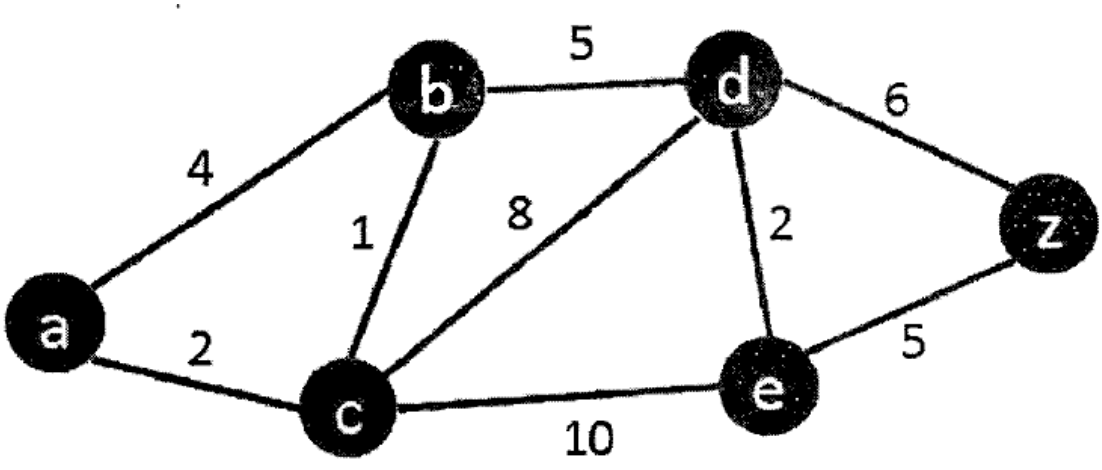
   2, 1, 5, 13, 55, 22, 77, 17, 50

6. Explain greedy method. Also design a greedy algorithm for the coin-changing problem.

SECTION-D

7. Differentiate between depth-first search and breadth-first search traversal of a graph with an example.

8. Consider the graph given below. Find the shortest path from 'a' to 'z' using Dijkstra's algorithm :



SECTION-E

9. **Answer the following :**

a) List the applications of graphs.

b) List the applications of stacks.

c) Explain the advantage of AVL tree over binary search tree.

d) What is an algorithm?

e) Explain the difference between time and space complexity of an algorithm.

f) What do you mean by dynamic programming? Explain.

g) Quick sort shows quadratic behavior in certain situations. Justify.

h) What is the time complexity of selection sort algorithm?

i) What do you mean by NP-Hard and NP-complete problems?

j) How are graph represented inside a computer's memory?

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.