CLASS: B.TECH   SEMESTER : V
BRANCH: BT/CP&P/CHEMICAL/CE/EEE/ECE/ME/PIE   SESSION : MO/2022

SUBJECT: CS275 FUNDAMENTALS OF DATA STRUCTURES

TIME: 03 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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Q.1(a)   Define a *non linear* data structure.   [2]
Q.1(b)   Illustrate the *insertion* and *deletion* at the end of a circular linked list.   [3]
Q.1(c)   Solve the recurrence relation: $T(n) = T(n-2) + 2n^2 + 1$ [5]

Q.2(a)   Demonstrate the *Push* and *Pop* operations   [2]
Q.2(b)   State the difference between *deque* and *dequeue*.   [3]
Q.2(c)   Design an algorithm to implement a stack using *minimal* number of queues   [5]

Q.3(a)   Compose two examples where Depth First Search and Breadth First Search are more suitable than   [2]
         the other.
Q.3(b)   [3]
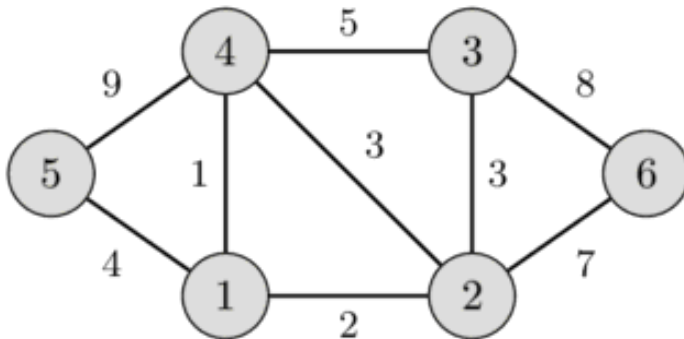
         Illustrate the above undirected graph using *adjacency matrix* and *adjacency list*
Q.3(c)   Find the minimum spanning tree step by step of the above graph by any appropriate algorithm   [5]
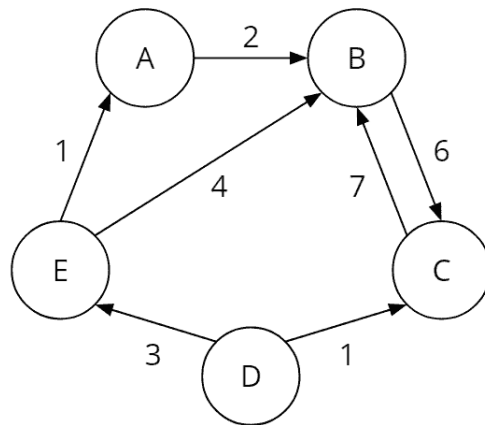   having time complexity of *O (E log V)*.

Q.4(a)   Describe the need of a height balanced binary search tree. Name a few height balanced search   [2]
         trees.
Q.4(b)   [3]
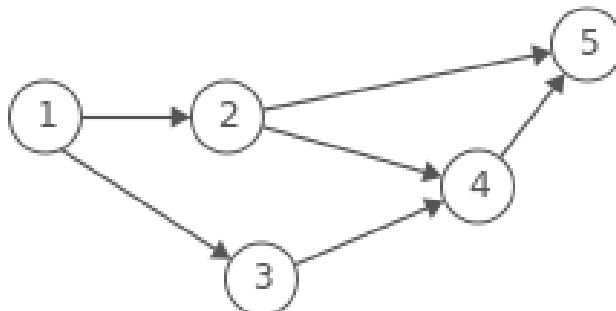
         Demonstrate and explain topological sort over the above graph by *Kahn's* algorithm.

Q.4(c)   [5]

Find all pair shortest paths by any appropriate algorithm having time complexity <= $O(V^3)$

Q.5(a) Given the array 31, 12, 25, 8, 32, 17, 50, 110, 31 (sort it in *increasing* order for all three questions   [2]
        as below, Don't need to write the algorithm - only step by step output)

        Derive the output of *bubble* sort or *selection* sort set by step.
Q.5(b) Derive the output of *heap* sort step by step.   [3]
Q.5(c) Derive the output of *quick* sort step by step taking pivot as the *first* element.   [3]
Q.5(d) Describe a condition with an example where *quick* sort have time complexity of $O(n^2)$ [2]

:::::25/11/2022:::::M