ALGO ASSIGNMENT 05

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Sec: B

QUESTION 01

(a)

P problems

Problems which can be solved by a Deterministic Turing machine in polynomial time are called P-problems.

NP Problems

Problems which can be solved by a non-Deterministic Turing machine in ~~during~~ polynomial Time are called NP Problems.

P=NP Explanation

It means whether an NP class problem can belong to P-class problems.

Basically, if a problem takes polynomial time on a non-deterministic Turing machine, Then one can build a deterministic turing machine which would solve the same problem also in polynomial time.

b) A NP-Problem implies that its very much possible that no polynomial time algorithm ~~do~~ exists for solving it.

Therefore finding developing approximate algorithms make it possible to develop polynomial-time algos to find a near optimal solution.

c) <u>NP-Hard Problems:-</u>

A problem is NP hard if every problem can be reduced to it in polynomial time

<u>weakly NP hard Problems:-</u>

weakly NP-hard are such NP complete problems when the parameters are encoded in binary

d) A 3SAT problem is a decision problem where a ~~given~~ Boolean formula is given in conjuctive normal form with each clause containing exactly three literals

e) ~~NP-complete problems belong to a class of problems~~

If a problem is NP and all other NP problems are polynomial time reducible to it, the problem is called NP complete.

<u>Example:-</u> Some of the famous examples of NP complete problems are.

1) Travelling Salesman problem
2) Graph-covering problem
3) Satisfiabily problem.

g) The problem is NP-Hard since its validated in $T(n) = 2^n$ time.

QUESTION 02

PROOF:-

→ lets assume that the minimum vertex cover is A^*

And
→ The vertex cover produced the ApproxVertexCover (G) is: A

→ The edges choosen by the algorithm are B.

→ Now a vertex in A^* can only cover a single in B Thus we can say

$$|A^*| \geq |B|$$

→ For each edge in B, there are 2 vertices in A Thus,

$$|A| = 2|B|$$

We can say,

$$|A^*| \geq |A|/2$$

we can rearrang it,

$$\boxed{\frac{|A|}{|A^*|} \leq 2}$$ Hence Proved!!!

QUESTION 03

→ Since there are no repeated letters in the set, the 1st word which appears ~~first will be selected~~ in terms of max number of letters will be selected.

→ Taking a look at the given set of words, "thread" fills the criteria

→ Now we look on other words, since "lost" has 4 letters that haven't been covered yet so it will be selected next.

→ ~~After~~ Afterwards, we pick the word "drain" since it has 2 additional letters, after that only "shun" is left that has unmentioned letters after which our set becomes completed.

Now our selection order will be,

{thread, lost, drain, shun}

QUESTION 04

a) Jarvis-March:

(-6,-10) → (+6,-6) → (8,0) → (9,5) → (-8,8) →

(-10,4) → (-10,3) → (-8,-6)

b) Graham Scan:

Deleted points:

(6,2) → (6,4) → (-2,2) → (-4,4) → (-3,4)

Sorted Points:

(-6,-10) → (+6,-6) → (8,0) → (9,5) → (6,2) →
(6,4) → (-2,2) → (-4,-4) → (-3,4) → (-8,8) →
(-10,4) → (-10,3) → (-8,-6)