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Ans 3. Graph: G.

u, and v are edge disjoint paths.

$\therefore E(P_1) \cap E(P_2) = \phi$.

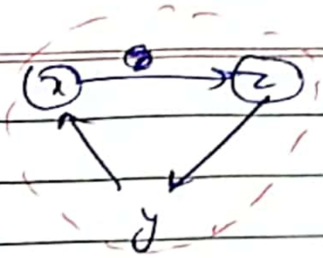
Relation $R := \sim$ ~~[illegible]~~.

$\sim$ is Reflexive. $\because u \sim u$. ✓ True.
$\sim$ is also Symmetric.

and $u \sim x$, $x \sim v \Rightarrow u \sim v$

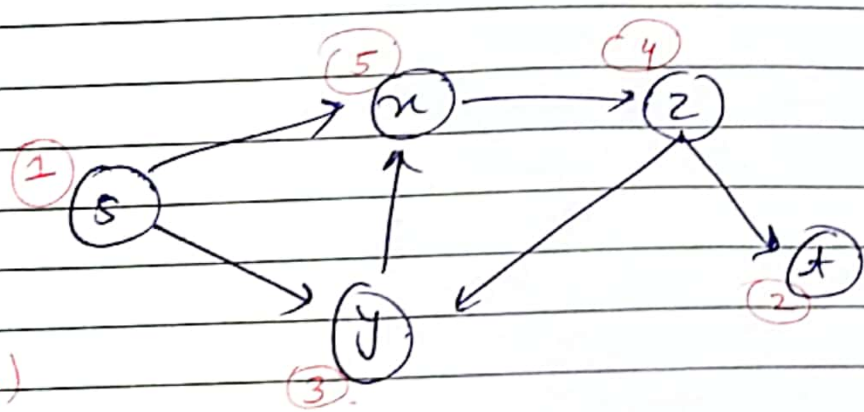
$\therefore$ it is also transitive.

Hence $\sim$ is an equivalence relⁿ.

Ans 4. SCC's :  , t , s.

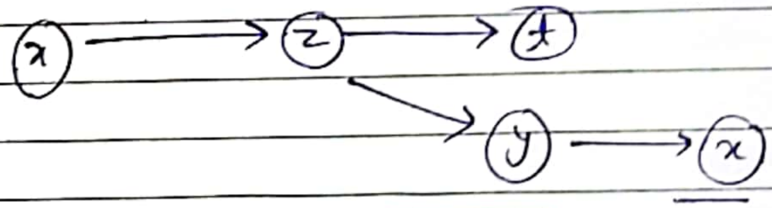
these 3 are the SCC's in ~~above~~ given graph.

Graph:



Let's mark the vertex no.
(random marking)

∴ Starting from highest number vertex i.e x.



$f(3) = f(y) = 1$

$f(2) = f(t) = 2.$

$f(4) = f(z) = 3.$

$f(5) = f(x) = 4$

$f(1) = f(s) = 5$

Finishing time of each vertex.

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Ans 7. $Subsetsum(i, T') = \begin{cases} 0 & \text{if } i = 0. \\ Subset Sum(i-1, T') & \text{if } x(i) > T' \\ \max\left(Subsetsum(i-1, T'),\ Subsetsum(i-1, T' - X[i]) + W(i)\right) & \end{cases}$

Pseudocode: - as

The following recurrence relationship takes X[i] if it greater than T.

The algo considers both cases, when X(i) was considered and not considered. The corresponding weight is added.

Then func. ensures that max. values is outputed.

If there's no o/p, result is $-\infty$ the individual value since it is simple brute force which considers every subset and consider the max. value. Thus the algo is correct.

Scanned with CamScanner

Ans 2. To prove: For all i $L_i = \{x \mid d(s,x) = i\}$

Proof:- Base case $(i=0)$

$\therefore L_0 = s$. s: Source vertex.

Inductive Condn:

. if y was added to L_{i+1}, then $d(s,y) = i+1$

If we prove above condn then we can conclude that $L_{i+1} = \{y \mid d(s,y) = i+1\}$.

Proof :- if y is added to L_{i+1},

it was added by traversing an edge (x,y) where $x \in L_i$ so that there's path from s to y. So taking shortest path from s to x followed by (x,y).

$$d(s,y) \le d(s,x) + 1.$$

Since $x \in L_i$, by induction hypothesis.

$$d(s,x) = i.$$

$$\therefore d(s,y) \le i+1.$$

However sing $y \notin L_j$ for any $j \le 1$, by induction hypothesis $d(s,y) > i$

$$\therefore \boxed{d(s,y) = i+1}$$