AI assignment2

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Algorithm for converting the problem into CNF

- **TYPE 1 clauses:**
  Each edge in the given graph should be present in at-least one of the subgraphs i.e. for an edge i in graph and subgraph j where 1 <= j <= k So, add clauses-
  for each i
  $e_{i,1} \vee e_{i,2} \vee ... \vee e_{i,k}$
  Complexity $O(kn^2)$

- **TYPE 2 clauses:**
  No subgraph should be empty i.e. at least one edge j where 1 <= j <= n of graph should be present in a subgraph k. So, add clauses-
  for each k
  $e_{1,k} \vee e_{2,k} \vee ... \vee e_{n,k}$
  Complexity $O(kn^2)$

- **TYPE 3 clauses:**
  Any edge which is not in the given graph should not be in any of the subgraphs. So, add clauses-
  for each e_j not present in the given graph
  $NOT\ e_{j,1}$ & $NOT\ e_{j,2}$ & ... & $NOT\ e_{j,k}$
  Complexity $O(kn^2)$

- **TYPE 4 clauses:**
  Each subgraph should be complete. If an edge from i to j $e_{ij,k}$ is present in subgraph k then $V_{i,k}$ and $V_{j,k}$ should also be present and vice verse should also be true. So, add clauses-
  for each $e_{ij,k}$ not present in the given graph
  $e_{ij,k} <=> (V_{i,k}$ & $V_{j,k})$
  whose CNF equivalent is $(NOT\ V_{i,k} \vee NOT\ V_{j,k} \vee e_{ij,k})$ & $(V_{i,k} \vee NOT\ e_{ij,k})$ & $(V_{j,k} \vee NOT\ e_{ij,k})$
  Complexity $O(kn^2)$

- **TYPE 5 clause:**
  No subgraph should be superset of the other subgraph i.e. not all vertices of one subgraph should be present in any other subgraph.So, add clauses-
  for two subgraphs k1 and k2
  for each vertex 1 <= i <= n
  $NOT(V_{1,k1} => V_{1,k2}$ & ..& $V_{i,k1} => V_{i,k2}$ & $V_{n,k1} => V_{n,k2})$
  Complexity $O(k^2n)$