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Batch C22

AIM: Implement Ford Fulkerson Method (Max Flow Network).

CODE:

```
from collections import defaultdict
class Graph:
    def __init__(self, graph):
        self.graph = graph
        self.ROW = len(graph)

    def bfs(self, s, t, parent):
        visited = [False] * self.ROW
        queue = []
        queue.append(s)
        visited[s] = True
        while queue:
            u = queue.pop(0)
            for ind, val in enumerate(self.graph[u]):
                if not visited[ind] and val > 0:
                    queue.append(ind)
                    visited[ind] = True
                    parent[ind] = u
        return visited[t], parent

    def ford_fulkerson(self, source, sink):
        max_flow = 0
        parent = [-1] * self.ROW
        while True:
            found_path, parent = self.bfs(source, sink, parent)
            if not found_path:
                break
            path_flow = float("Inf")
            s = sink
            while s != source:
                path_flow = min(path_flow, self.graph[parent[s]][s])
                s = parent[s]
            max_flow += path_flow
```



```
# Print the augmented path and its minimum value
path = [sink]
v = sink
while v != source:
    u = parent[v]
    path.insert(0, u)
    v = u
print("Augmented path: ", " -> ".join(str(x) for x in path), "
Minimum flow: ", path_flow)

v = sink
while v != source:
    u = parent[v]
    self.graph[u][v] -= path_flow
    self.graph[v][u] += path_flow
    v = u

return max_flow

graph = [ [0, 2, 3, 0, 0],
          [0, 0, 0, 0, 3],
          [0, 1, 0, 1, 0],
          [0,0,0,0,3],
          [0, 0, 0, 0, 0]]

g = Graph(graph)
source = 0
sink = 4
print("Max Flow: %d " % g.ford_fulkerson(source, sink))
```

OUTPUT:

```
PS C:\Users\Jadhav\Documents\BTech\Docs\6th Sem\AA\Code> & C:/msys64/mingw64/bin/python.exe "c:/Users/Jadhav/Documents
/6th Sem/AA/Code/MaxFlowNetwork_FordFulkerson.py"
Augmented path: 0 -> 1 -> 4 Minimum flow: 2
Augmented path: 0 -> 2 -> 1 -> 4 Minimum flow: 1
Augmented path: 0 -> 2 -> 3 -> 4 Minimum flow: 1
Max Flow: 4
PS C:\Users\Jadhav\Documents\BTech\Docs\6th Sem\AA\Code> □
```