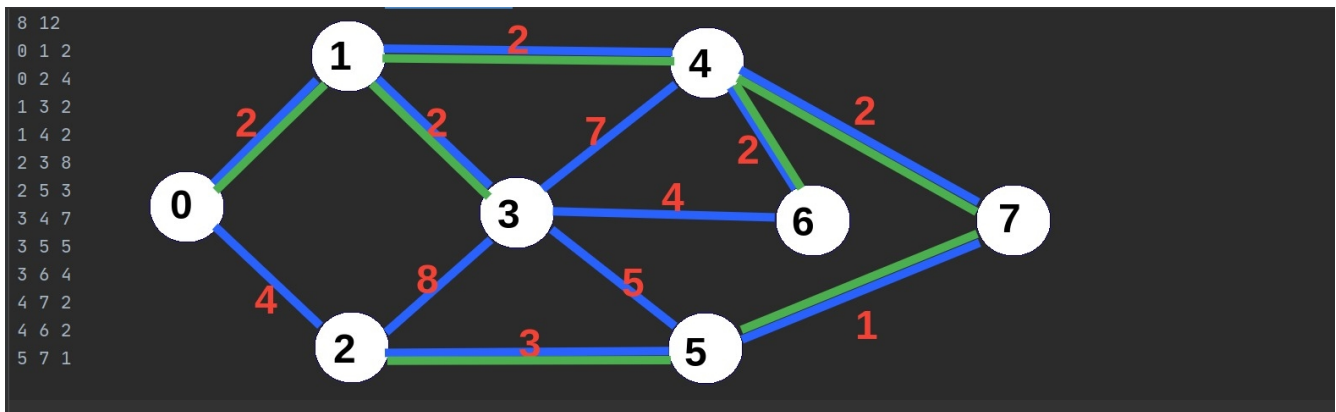# Detailed manual execution – graph 8 vertices 12 edges

step 1 prepare queue, prev, dist, edges, source, vertices, total cost
q = []
prev = {}
dist = {}
edges = []
source = 0
vertices = [0]
total cost = 0

step 2 push in queue all vertices that are accessible from the source
q = [(2, 1), (4, 2)]
prev = {1: 0, 2: 0}
dist = {1: 2, 2: 4}
edges = []
source = 0
vertices = [0]
total cost = 0

step 3 iterate through queue
current vertex = 1
q = [(2, 0), (2, 4), (2, 3), (4, 2)]
prev = {1: 0, 2: 0, 0: 1, 3: 1, 4: 1}
dist = {1: 2, 2: 4, 0: 2, 3: 2, 4: 2}
edges = [(1, 0)]
source = 0
vertices = [0, 1]
total cost = 2

current vertex = 0
q = [(2, 3), (2, 4), (4, 2)]
prev = {1: 0, 2: 0, 0: 1, 3: 1, 4: 1}

dist = {1: 2, 2: 4, 0: 2, 3: 2, 4: 2}
edges = [(1, 0)]
source = 0
vertices = [0, 1]
total cost = 2

current vertex = 3
q = [(2, 4), (4, 2), (5, 5), (4, 6)]
prev = {1: 0, 2: 0, 0: 1, 3: 1, 4: 1, 5: 3, 6: 3}
dist = {1: 2, 2: 4, 0: 2, 3: 2, 4: 2, 5: 5, 6: 4}
edges = [(1, 0), (3, 1)]
source = 0
vertices = [0, 1, 3]
total cost = 4

current vertex = 4
q = [(2, 6), (2, 7), (5, 5), (4, 6), (4, 2)]
prev = {1: 0, 2: 0, 0: 1, 3: 1, 4: 1, 5: 3, 6: 4, 7: 4}
dist = {1: 2, 2: 4, 0: 2, 3: 2, 4: 2, 5: 5, 6: 2, 7: 2}
edges = [(1, 0), (3, 1), (4, 1)]
source = 0
vertices = [0, 1, 3, 4]
total cost = 6

current vertex = 6
q = [(2, 7), (4, 2), (5, 5), (4, 6)]
prev = {1: 0, 2: 0, 0: 1, 3: 1, 4: 1, 5: 3, 6: 4, 7: 4}
dist = {1: 2, 2: 4, 0: 2, 3: 2, 4: 2, 5: 5, 6: 2, 7: 2}
edges = [(1, 0), (3, 1), (4, 1), (6, 4)]
source = 0
vertices = [0, 1, 3, 4, 6]
total cost = 8

current vertex = 7
q = [(1, 5), (4, 2), (5, 5), (4, 6)]
prev = {1: 0, 2: 0, 0: 1, 3: 1, 4: 1, 5: 7, 6: 4, 7: 4}
dist = {1: 2, 2: 4, 0: 2, 3: 2, 4: 2, 5: 1, 6: 2, 7: 2}
edges = [(1, 0), (3, 1), (4, 1), (6, 4), (7, 4)]
source = 0
vertices = [0, 1, 3, 4, 6, 7]
total cost = 10

current vertex = 5
q = [(1, 7), (3, 2), (5, 5), (4, 6), (4, 2)]
prev = {1: 0, 2: 5, 0: 1, 3: 1, 4: 1, 5: 7, 6: 4, 7: 5}
dist = {1: 2, 2: 3, 0: 2, 3: 2, 4: 2, 5: 1, 6: 2, 7: 1}
edges = [(1, 0), (3, 1), (4, 1), (6, 4), (7, 4), (5, 7)]
source = 0
vertices = [0, 1, 3, 4, 6, 7, 5]

total cost = 11

current vertex = 7
q = [(3, 2), (4, 2), (5, 5), (4, 6)]
prev = {1: 0, 2: 5, 0: 1, 3: 1, 4: 1, 5: 7, 6: 4, 7: 5}
dist = {1: 2, 2: 3, 0: 2, 3: 2, 4: 2, 5: 1, 6: 2, 7: 1}
edges = [(1, 0), (3, 1), (4, 1), (6, 4), (7, 4), (5, 7)]
source = 0
vertices = [0, 1, 3, 4, 6, 7, 5]
total cost = 11

current vertex = 2
q = [(4, 2), (4, 6), (5, 5)]
prev = {1: 0, 2: 5, 0: 1, 3: 1, 4: 1, 5: 7, 6: 4, 7: 5}
dist = {1: 2, 2: 3, 0: 2, 3: 2, 4: 2, 5: 1, 6: 2, 7: 1}
edges = [(1, 0), (3, 1), (4, 1), (6, 4), (7, 4), (5, 7), (2, 5)]
source = 0
vertices = [0, 1, 3, 4, 6, 7, 5, 2]
total cost = 14

current vertex = 2
q = [(4, 6), (5, 5)]
prev = {1: 0, 2: 5, 0: 1, 3: 1, 4: 1, 5: 7, 6: 4, 7: 5}
dist = {1: 2, 2: 3, 0: 2, 3: 2, 4: 2, 5: 1, 6: 2, 7: 1}
edges = [(1, 0), (3, 1), (4, 1), (6, 4), (7, 4), (5, 7), (2, 5)]
source = 0
vertices = [0, 1, 3, 4, 6, 7, 5, 2]
total cost = 14

current vertex = 6
q = [(5, 5)]
prev = {1: 0, 2: 5, 0: 1, 3: 1, 4: 1, 5: 7, 6: 4, 7: 5}
dist = {1: 2, 2: 3, 0: 2, 3: 2, 4: 2, 5: 1, 6: 2, 7: 1}
edges = [(1, 0), (3, 1), (4, 1), (6, 4), (7, 4), (5, 7), (2, 5)]
source = 0
vertices = [0, 1, 3, 4, 6, 7, 5, 2]
total cost = 14

current vertex = 5
q = []
prev = {1: 0, 2: 5, 0: 1, 3: 1, 4: 1, 5: 7, 6: 4, 7: 5}
dist = {1: 2, 2: 3, 0: 2, 3: 2, 4: 2, 5: 1, 6: 2, 7: 1}
edges = [(1, 0), (3, 1), (4, 1), (6, 4), (7, 4), (5, 7), (2, 5)]
source = 0
vertices = [0, 1, 3, 4, 6, 7, 5, 2]
total cost = 14

final step print all the edges and the total cost

a minimum spanning tree is:
(1, 0)
(3, 1)
(4, 1)
(6, 4)
(7, 4)
(5, 7)
(2, 5)
total cost: 14