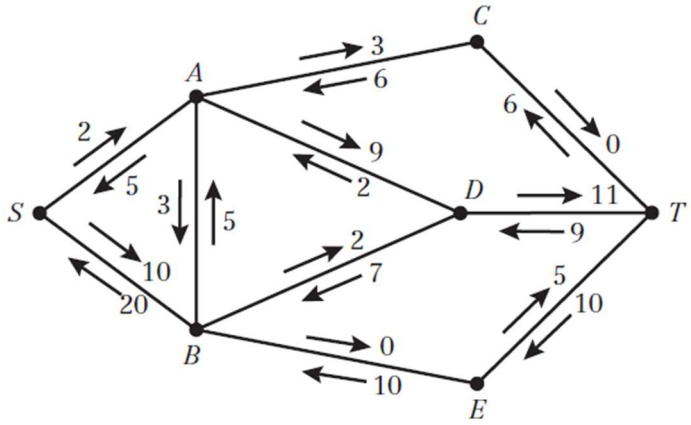
Flow in networks 3D

1 a



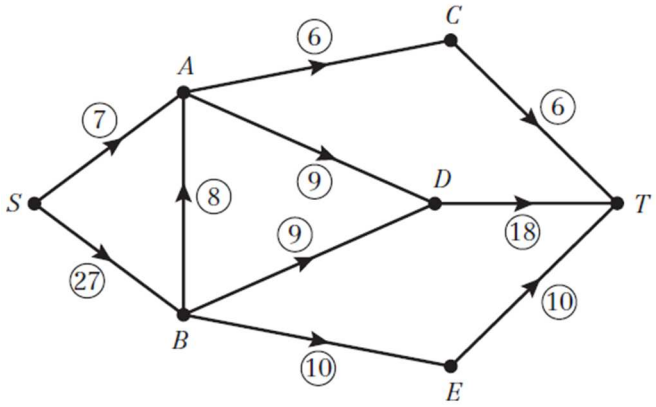
For example (there are many other combinations of flows possible)

$SBADT - 5$

$SADT - 2$

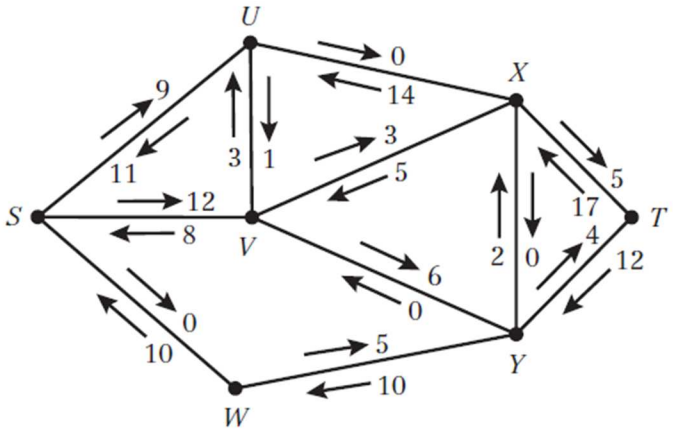
$SBDT - 2$

b



Value of maximum flow is 34

2 a



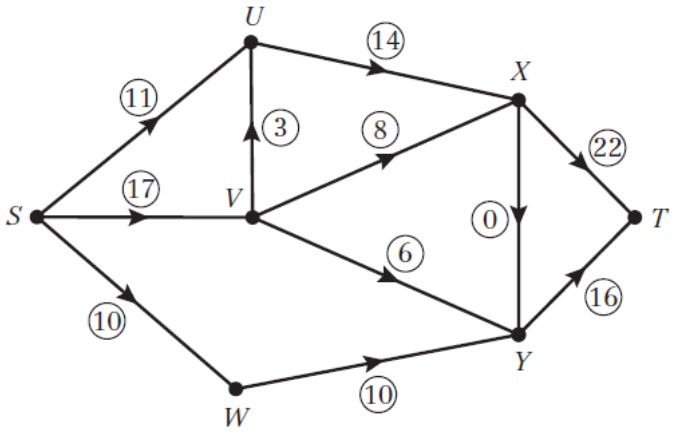
For example (there are many other combinations of flows possible)

$SVYT$ – 4

$SVXT$ – 3

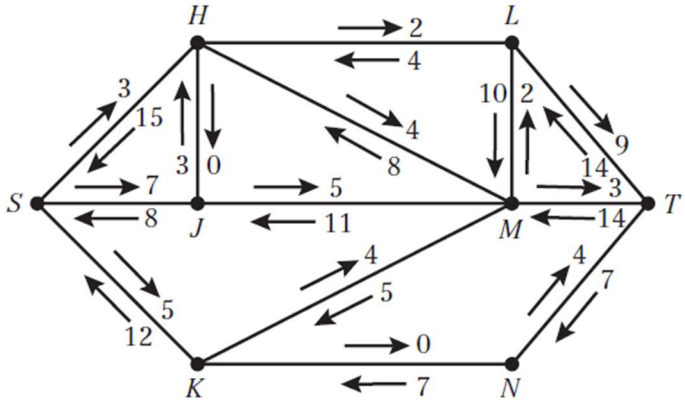
$SVYXT$ – 2

b



Value of maximum flow is 38

3 a



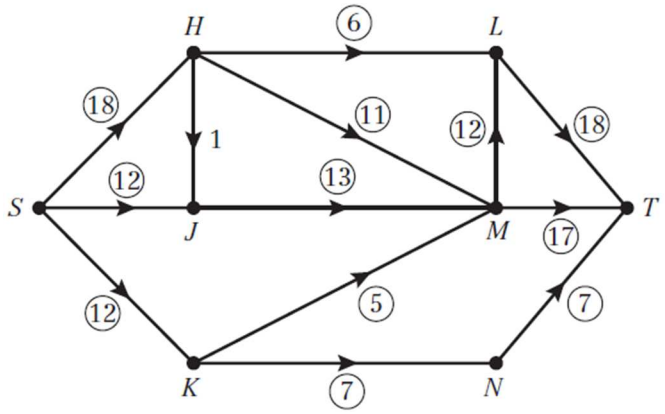
For example (there are many other combinations of flows)

$SHMT$ – 3

$SJMLT$ – 2

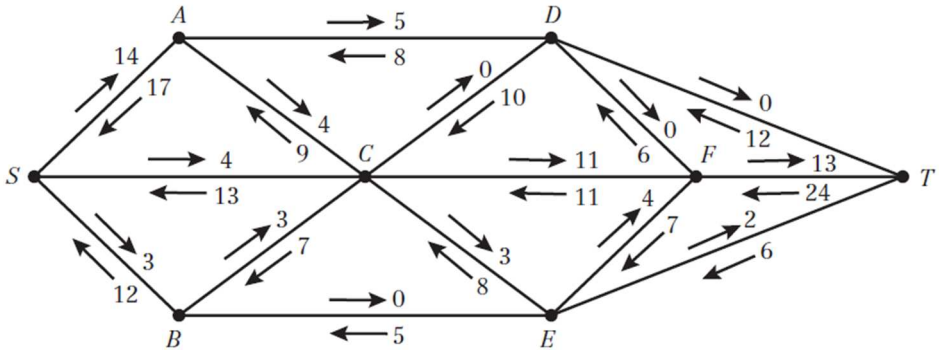
$SJHLT$ – 2

3 b



Value of maximum flow is 42

4 a



For example (there are many other combinations of flows)

$SACFT$ – 4

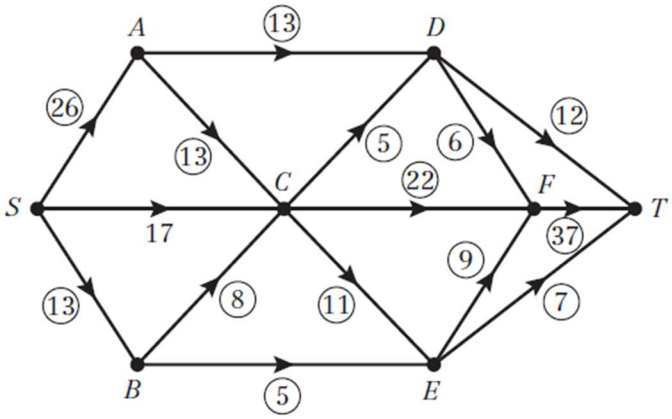
$SADCFT$ – 5

$SCFT$ – 2

$SCEFT$ – 2

$SBCET$ – 1

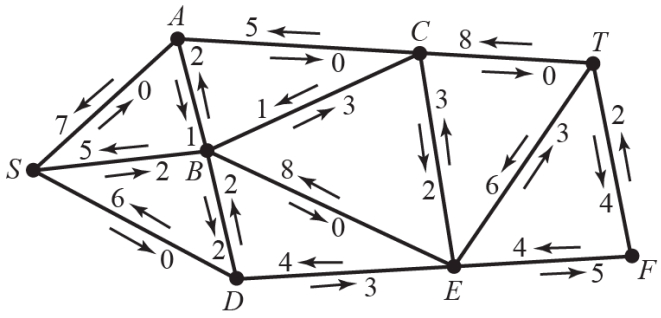
b



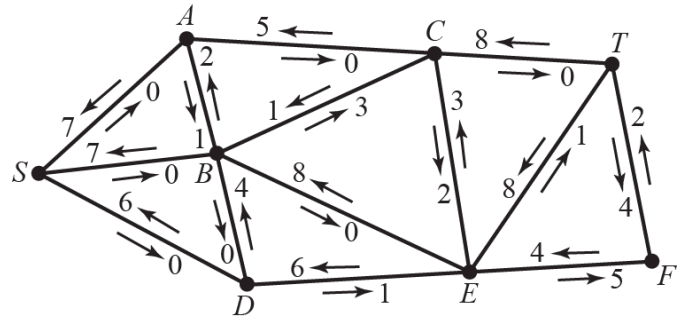
Value of maximum flow is 56

5 a To find the capacity of a cut we need to sum up the capacities coming out of it.
Hence: $C_1 = SA + SB + SD = 7 + 7 + 6 = 20$
So the capacity of C_1 is 20
$C_2 = DE + BE + CT = 7 + 8 + 8 = 23$
So the capacity of C_2 is 23
Note that EC flows out of the cut so it does not contribute to the capacity.

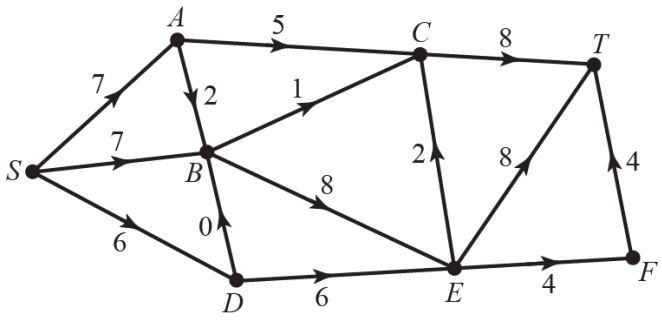
b The initial diagram looks like this



We cannot add any flow along SA or SD because they are both saturated. So the only option is SB. From there we could go to A or E but there is no capacity left there. The remaining routes are BC and BD. We arbitrarily choose BD. There's capacity of 2 along S$BDET$. New diagram:

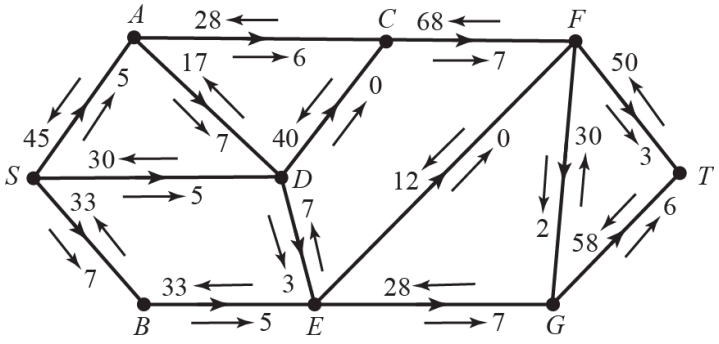


Now all the arcs coming out of S are saturated, hence the flow is maximal. The final network:



To find the maximum flow we sum the flows coming out of S or into T:
$SA + SB + SD = 20$
Similarly:
$CT + ET + FT = 20$
(Checking that both flows are equal is a good way to ensure your working is correct!).
So the maximum flow is 20

6 a To visualise the network better, consider the following diagram
From this we can easily see the routes with spare capacities of 5: *SBEGT* and *SACFEGT*.



b The only valid route for the data packet is *SBEGT*. The data cannot travel using *SACFEGT* since the direction of data flow is from *E* to *F* and not from *F* to *E* (So basically, this route re-directs some of the data flow by **decreasing** the flow between *EF* and **increasing** flow along *EG* instead).