PIPES AND NETWORKS CLASS-2

The following sketch shows the pipelines carrying material from one location to another. Each location has a demand for material.

The demand at Vaishali is 400, at Jyotishmati is 400, at Panchal is 700, and at Vidisha is 200. Each arrow indicates the direction of material flow through the pipeline. The flow from Vaishali to Jyotishmati is 300. The quantity of material flow is such that the demands at all these locations are exactly met. The capacity of each pipeline is 1,000.
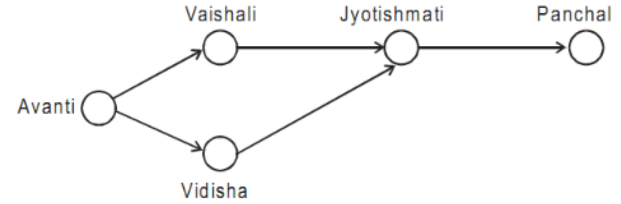
1. The quantity moved from Avanti to Vidisha is
a. 1000
b. 800
c. 700
d. 200
2. The free capacity available at the Avanti-Vaishali pipeline is
a. 0
b. 100
c. 200
d. 300

The network shows the water pipelines connecting the 6 cities (A,B,C,D,E and F) Water can flow only is the direction as indicated by the arrow.
- The maximum carrying capacity of pipelines leaving A i.e., (A-Band A-D) is 1500 m3 per day while that of others is 1000m3 per day.
- The daily requirement at C and D is in the ratio 2 : 3
- Water flow in pipeline BE is 600m3
- Slack in pipelines CE and CF is the same
- Daily requirement at D and E is in the ratio 2:3
- Slack in AB in 200 m3 less than the slack in AD
- Difference in the daily requirement at C and E is 500 m3
- Slack in AD and the flow in DB is in the ratio 1:2

SET-2
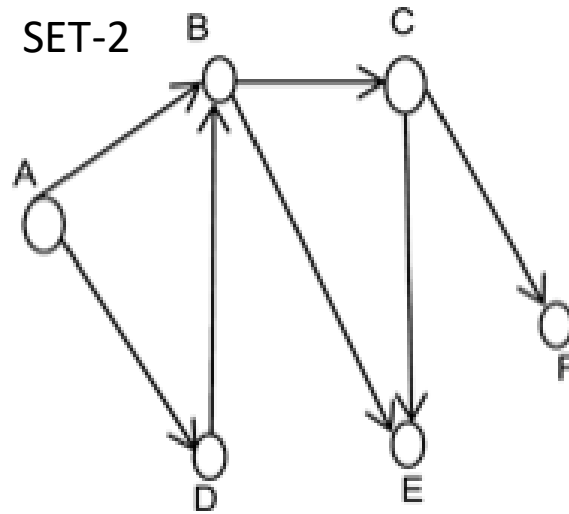
Q1. Find the daily requirement (in m3) at F, if it is known that its requirement is exactly met by the water flowing through the pipelines shown
a. 200 b. 300 c. 600 d. 450

Q2. Find the daily requirement (in m3) at B, if it is Known that requirement at all cities are exactly met by water flowing through the pipelines shown.
a. 400 b. 300 c. 600 d. Cannot be determined

Q3. If there exists a large external pipeline of capacity 4000 m3 that supplies water to city A such that the requirement at all the six cities are exactly met by water supplied by it, then what is the slack in the external pipeline? (Daily requirement at A = 500 m3)
a. 800 b. 1200 c. 900 d. 1000

Q4. If on a particular day, the pipeline connecting cities D and B is damaged and half the quantity of water that is intended to flow through pipeline connecting D and B gets wasted in the process, then find how much water is wasted on that day?
a. 600 b. 300 c. 500 d. 250

The network below shows the natural gas pipelines connecting six distribution centers P through U and refinery X. The natural gas can flow only in the direction as indicated by the arrow.

SET-3

1. The maximum carrying capacity of pipelines leaving the refinery X is 2500 m3 per day while that of others is 1000 m 3 per day.
2. Slack in pipeline connecting X and Q equal to daily requirement of distribution center T.
3. The daily requirement of distribution center P and flow of pipeline PS are equal which is double the daily requirement of center S.
4. The gas flow in pipelines RS, RT and QP are in arithmetic progression with common difference of 50m3 and sum of the flows as 600m3 with now in pipeline RS being the lowest.
5. The daily requirement of center Q is 650m3 per day.
6. The flow in pipeline PR is 900m3.
7. The slack in pipeline XP is 450m3 less than that in pipeline XQ.
8. Flow in pipeline QT is 200 m3 more than that in pipeline SU.
9. The slack in a pipeline is the excess flow required to bring it to full capacity.

Q1. What is the flow of natural gas in pipeline XQ?
a. 1750 m3   b. 1600m3   c. 1550m3   d. 1700m3

Q2. Find the daily requirement at distribution center S (in m3), if it is known that its requirement is exactly met by the water flowing through the pipelines shown.
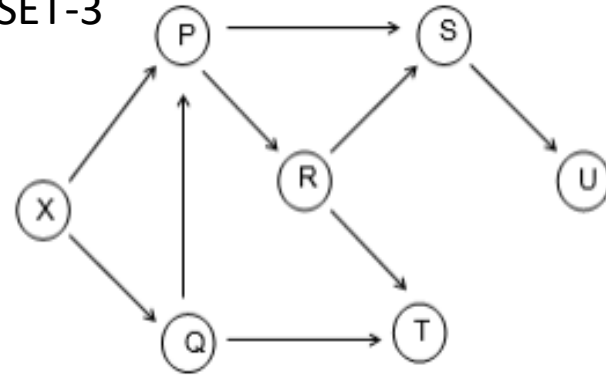a. 350m3   b. 550m3   c. 650m3   d. 700m3

Q3. Find the daily requirement at center U (in m3). if it is known that daily requirement of all centers are exactly met by the natural gas through the pipelines shown.
a. 400 m3   b. 500 m3   c. 600 m3   d. 650 m3

Q4. What is the slack (in m3) in all the pipelines together?
a. 6250m3   b. 6800m3   c. 4950m3   d. 5450m3

The network gives the flow of oil through a set of pipelines connecting refinery A with seven depots P through V. The flow in the pipelines is such that only after the requirement at the intermediate depots is completely met, is the oil passed on to the next depot in the network. The values above each depot denote the requirement at that place and the values above each pipeline denote the flow in the pipeline (in kl) The capacity of each pipeline is 1500kls. The slack in a pipeline is defined as the excess flow required to bring it to full capacity.
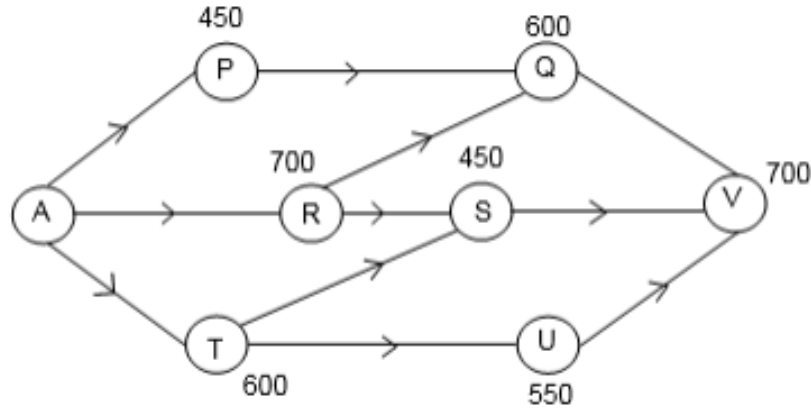
The arrows denote the direction of flow and it is known that the flow in the network is such that the demand at all the places is exactly met.

Q1. What is the minimum flow (in kls) in the pipeline connecting P and Q?
Q2. What is the minimum slack (in kls) in the pipeline connecting T and U?
Q3. What is the minimum flow (in kls) in the pipeline connecting Rand S?
Q4. What is the total slack (in kls) in all the pipelines together?