

ROUTES AND NETWORK - II

Direction: The figure below shows the plan of a town. The streets are at right angles to each other. A rectangular park (P) is situated inside the town with a diagonal road running through it. There is also a prohibited region (D) in the town.



 Neelam rides her bicycle from her house at A to her office at B, taking the shortest path. Then the number of possible shortest paths that she can choose is a) 60 b) 75 c) 45 d) 90

Directions: Read the information carefully and answer the question given below.

Seven tanks A, B, P, Q, R, X and Y are connected through similar pipes to a reservoir of water as shown in the following diagram. The number written beside each tank in the diagram indicates the capacity of the tank in litres. Water flows at the rate of 25 litres per minute through each of the pipes simultaneous, from the reservoir to each of the tanks.

- (i) When tank A is half full the water from A starts flowing to B at the rate of 25 litres per minute
- When P, Q and R are full, water starts flowing from these tanks to Q, Y and X respectively at the abovementioned rate.,
- (iii) When X is 1/4; full, water starts flowing from X to A at the above-mentioned rate.
- (iv) Outflow from each tank stops when the tank, in which water is flowing from this tank is full;



- Among A, B, X and Y which tank gets filled first?
 a) A
 b) B
 c) X
 d) Y
- 3. How many minutes after R is full, P become full? a) 6 b) 4 c) 1 d) 3
- 4. Which tank takes the longest time to get filled? a) B b) A c) X d) Y

Directions: The diagram shows the interconnections between a refinery and the depots. (number 2-8) Oil form the refinery is to be transported to these depots using tankes. the capacity of the depots (in 000 liters) are given. The distance from the refinery to the depots and between two neighbouring depots are also given. Oil can be transported only in the direction in which the arrows point. So also at each depot, only after kit is filled to full capacity, the remaining quantity can be passed to Ithe next depots. Irrespective of the quantity tranported, the cost of transportation is rs150/km. Oil can be transmitted only in quantities which are intergral multiplies of 50,000 liters. All deposts currently hold 50% of their capacities.



- 5. Find the minimum Cost required for transporting oil from the refinery to depot 8"?
 a) 67500 b) 75000 c) 57000 d) 84500
- 6. What should be the minimum quantity that is sent the from refinery for at least part of it to reach depot 8?
 a) 300000
 b) 600000
 c) 540000
 d) 350000

Direction: A significant amount of traffic flows from point S to point T in the one-way street network shown below.

Points A, B, C and D are junctions in the network, and the arrows mark the direction of traffic flow.

The fuel cost in rupees for travelling along a street is indicated by the number adjacent to the arrow representing the street. Motorists travelling from point S to point T would obviously take the route for which the total cost of travelling is the minimum.

If two or more routes have the same least travel cost, then motorists are indifferent between them.

Hence, the traffic gets evenly distributed among all the least cost routes. The government can control the flow of traffic only by levying appropriate toll at each junction. For example, if a motorist takes the route S - A - T (using junction A alone), then the total cost of travel would be Rs 14 (i.e. Rs 9 + Rs 5) plus the toll charged at junction A.



- 7. If the government wants to ensure that all motorists travelling from S to T pay the same amount (fuel costs and toll combined) regardless of the route they choose and the street from B to C is under repairs (and hence unusable), then a feasible set of toll junctions A, charged (in rupees) at Β. C and D respectively to achieve this goal is : a) 2, 5, 3, 2 b) 0, 5, 3, 1 d) 2, 3, 5, 1 c) 1, 5, 3, 2 e) B and C both
- 8. If the government wants to ensure that all routes from S to T get the same amount of traffic, then a feasible set of toll charged (in rupees) at junctions A, B, C and D respectively to achieve this goal is :

 a) 0, 5, 2, 2
 b) 0, 5, 4, 1
 c) 1, 5, 3, 3
 d) 1, 5, 3, 2
 e) 1, 5, 4, 2
- 9. The government wants to devise a toll policy such that the total cost to the commuters per trip is minimized. The policy should also ensure that not more than 70 percent of the total traffic passes through junction B. The cost incurred by the commuter travelling from point S to point T under this policy will be:
 a) \$ 7
 b) \$ 9
 c) \$ 10

e) \$14

d) \$13

- 10. If the government wants to ensure that the traffic at S gets evenly distributed along streets from S to A, from S to B, and from S to D, then a feasible set of toll charged (in rupees) at junctions A, B, C, and D respectively to achieve this goal is:
 a) 0, 5, 4, 1
 b) 0, 5, 2, 2
 c) 1, 5, 3, 3
 d) 1, 5, 3, 2
 e) 0, 4, 3, 2
- 11. If the government wants to ensure that no traffic flows on the street from D to T, while equal amount of traffic flows through junctions A and C, then a feasible set of toll charged (in rupees) at junctions A, B, C and D respectively to achieve this goal is

 a) 1, 5, 3, 3
 b) 1, 4, 4, 3
 c) 1, 5, 4, 2
 d) 0, 5, 2, 3
 e) 0, 5, 2, 2

Direction: These questions are based on the following information.

Power source I supplies 90 units of power and power source II also supplies 90 units of power to various substations at A, B, C, D, E and F as shown in the following figure.



Each of the arrows indicates the direction in which power flows and the number adjacent to it indicates the total units of power that flows through it. At any substation power flows out after meeting the requirement at that substation. At each substation, some power is required.

- 12. How many units of power is required at F?
 - a) 60 units b) 70 units c) 50 units d) 45 units
 - 50 units a) 45 units
- 13. For which of the following pairs of substations the power requirement is the same?a) A, Db) A, Ec) B, Cd) None
- 14. If the requirement at D is increased by 30 units then what is the shortfall at F? (Shortfall = original requirement Inflow)
 a) 10 units
 b) 30 units
 c) 20 units
 d) 15 units

Direction: The figure below shows the street map for a certain region with the street intersections marked from a through I. A person standing at an intersection can see along straight lines to other intersections that are in her line of sight and all other people standing at these intersections. For example, a person standing at intersections b, c, e, f, h, and k. In particular, the person standing at intersection g can see the person standing at intersection e irrespective of whether there is a person standing at intersection f.



Six people U, V, W, X, Y, and Z, are standing at different intersections. No two people are standing at the same intersection.

The following additional facts are known.

- 1. X, U, and Z are standing at the three corners of a triangle formed by three street segments.
- 2. X can see only U and Z.
- 3. Y can see only U and W. $% \left({{{\mathbf{W}}_{{\mathbf{W}}}} \right)$
- 4. U sees V standing in the next intersection behind Z
- 5. W cannot see V or Z.
- 6. No one among the six is standing at intersection d.



16.	Who can V see?	
	a) U and Z only	b) Z only
	c) U only	d) U, W and Z only

- 17. What is the minimum number of street segments that X must cross to reach Y?a) 1 b) 2 c) 3 d) 4
- 18. Should a new person stand at intersection d, who among the six would she see?a) W and X only
 - b) U and W only
 - c) V and X only
 - d) U and Z only

Direction: Four cars need to travel from Akala (A) to Bakala (B). Two routes are available, one via Mamur (M) and the other via Nanur (N). The roads from A to M, and from N to B, are both short and narrow. In each case, one car takes 6 minutes to cover the distance, and each additional car increases the travel time per car by 3 minutes because of congestion. (For example, if only two cars drive from A to M, each car takes 9 minutes.) On the road from A to N, one car takes 20 minutes, and each additional car increases the travel time per car by 1 minute. On the road from M to B, one car takes 20 minutes, and each additional car increases the travel time per car by 0.9 minute.

The police department orders each car to take a particular route in such a manner that it is not possible for any car to reduce its travel time by not following the order, while the other cars are following the order.

- 19. How many cars would be asked to take the route A-N-B, that is Akala-Nanur-Bakala route, by the police department?
- 20. If all the cars follow the police order, what is the difference in travel time (in minutes) between a car which takes the route A-NB and a car that takes the route A-M-B?
 - a) 1 b) 0.1 c) 0.2 d) 0.9
- 21. A new one-way road is built from M to N. Each car now has three possible routes to travel from A to B: A-M-B, A-N-B and A-MN-B. On the road from M to N, one car takes 7 minutes and each additional car increases the travel time per car by 1 minute. Assume that any car taking the A-M-N-B route travels the A-M portion at the same time as other cars taking the A-M-B route, and the N-B portion at the same time as other cars taking the A-N-B route.

How many cars would the police department order to take the A-M-N-B route so that it is not possible for any car to reduce its travel time by not following the order while the other cars follow the order? (Assume that the police department would never order all the cars to take the same route.)

22. A new one-way road is built from M to N. Each car now has three possible routes to travel from A to B: A-M-B, A-N-B and A-MN-B. On the road from M to N, one car takes 7 minutes and each additional car



Direction: A new airlines company is planning to start operations in a country. The company has identified ten different cities which they plan to connect through their network to start with. The flight duration between any pair of cities will be less than one hour. To start operations, the company has to decide on a daily schedule.

The underlying principle that they are working on is the following:

Any person staying in any of these 10 cities should be able to make a trip to any other city in the morning and should be able to return by the evening of the same day.

23. If the underlying principle is to be satisfied in such a way that the journey between any two cities can be performed using only direct (non-stop) flights, then the minimum number of direct flights to be scheduled is:

a) 45 b) 90 c) 180 d) 135

24. Suppose three of the ten cities are to be developed as hubs. A hub is a city which is connected with every other city by direct flights each way, both in the morning as well as in the evening. The only direct flights which will be scheduled are originating and/or terminating in one of the hubs. Then the minimum number of direct flights that need to be scheduled so that the underlying principle of the airline to serve all the ten cities is met without visiting more than one hub during one trip is:



- 25. Suppose the 10 cities are divided into 4 distinct groups G1, G2, G3, G4 having 3, 3, 2 and 2 cities respectively and that G1 consists of cities named A, B and C. Further, suppose that direct flights are allowed only between two cities satisfying one of the following:
 - 1. Both cities are in G1
 - 2. Between A and any city in G2
 - 3. Between B and any city in G3
 - 4. Between C and any city in G4

Then the minimum number of direct flights that satisfies the underlying principle of the airline is: (TITA)

26. Suppose the 10 cities are divided into 4 distinct groups G1, G2, G3, G4 having 3, 3, 2 and 2 cities respectively and that G1 consists of cities named A,



B and C. Further, suppose that direct flights are allowed only between two cities satisfying one of the following:

- 1. Both cities are in G1
- 2. Between A and any city in G2
- 3. Between B and any city in G3
- 4. Between C and any city in G4

However, due to operational difficulties at A, it was later decided that the only flights that would operate at A would be those to and from B. Cities in G2 would have to be assigned to G3 or to G4. What would be the maximum reduction in the number of direct flights as compared to the situation before the operational difficulties arose? (TITA)

Comprehension:

Given above is the schematic map of the metro lines in a city with rectangles denoting terminal stations (e.g. A), diamonds denoting junction stations (e.g. R) and small filled-up circles denoting other stations. Each train runs either in east-west or north-south direction, but not both. All trains stop for 2 minutes at each of the junction stations on the way and for 1 minute at each of the other stations. It takes 2 minutes to reach the next station for trains going in east-west direction and 3 minutes to reach the next station for trains going in north-south direction. From each terminal station, the first train starts at 6 am; the last trains leave the terminal stations at midnight. Otherwise, during the service hours, there are metro service very 15 minutes in the north-south lines and every 10 minutes in the east-west lines. A train must rest for at least 15 minutes after completing a trip at the terminal station, before it can undertake the next trip in the reverse direction. (All questions are related to this metro service only. Assume that if someone reaches a station exactly at the time a train is supposed to leave, (s)he can catch that train.)



Q.27 If Hari is ready to board a train at 8:05 am from station M, then when is the earliest that he can reach station N?

- A. 9:13 am
- B. 9:01 am
- C. 9:11 am
- D. 9:06 am

Q.28 If Priya is ready to board a train at 10:25 am from station T, then when is the earliest that she can reach station S?

- A. 11:28 am
- B. 11:12 am
- C. 11:22 am
- D. 11:07 am

Q.29 Haripriya is expected to reach station S late. What is the latest time by which she must be ready to board at station S if she must reach station B before 1 am via station R?

- A. 11:35 pm
- B. 11:49 am
- C. 11:43 pm
- D. 11:39 pm undamakers.com

Q.30 What is the minimum number of trains that are required to provide the service on the AB line (considering both north and south directions)?

Q.31 What is the minimum number of trains that are required to provide the service in this city?

Answer Kev

1. D	2. B	3. D	4. D	5.	6.	7. E	8. D	9. C	10. A		
11. E	12. A	13. C	14. B	15. C	16. A	17. B	18. A	19. 2	20. B		
21. 2	22. B	23. C	24. C	25.40	26. 4	27. C	28. B	29. D	30. 8		
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