**Summary:**

1 variations. Minimum spanning tree from table.

**Question:**

A company decides to network its computers. The computer terminals; A, B, C, D, E, F, G, H, I and J are located on one floor and need to be connected to each other.

<EFOFEX>
id:fxd{46ccc1a0-2528-4eec-a3d4-387fe93aba95}

FXData:

</EFOFEX>

The following table gives the distances (in metres) of feasible connections between the terminals.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** |
| **A** | - | 7 | 11 | 5 | 8 | 6 | - | - | - | 22 |
| **B** | 7 | - | 7 | 9 | 5 | - | 12 | 13 | - | - |
| **C** | 11 | 7 | - | 25 | 18 | - | - | - | - | 9 |
| **D** | 5 | 9 | 25 | - | 12 | 9 | 6 | 12 | 15 | 14 |
| **E** | 8 | 5 | 18 | 12 | - | - | 9 | 8 | 8 | 12 |
| **F** | 6 | - | - | 9 | - | - | 10 | - | - | - |
| **G** | - | 12 | - | 6 | 9 | 10 | - | 9 | 9 | - |
| **H** | - | 13 | - | 12 | 8 | - | 9 | - | 4 | 12 |
| **I** | - | - | - | 15 | 8 | - | 9 | 4 | - | 10 |
| **J** | 22 | - | 9 | 14 | 12 | - | - | 12 | 10 | - |

Cable used in the connections costs $15.50 per metre.

1. On the diagram, show the links that must be used to link the terminals together in the least costly way.
2. What is the minimum cost to link the computers?
3. When installing the new network, the installers discovered that the 9m link between C and J could not be used. What effect will this have on the minimum cost to link the computers?

[6,2,2 = 7 Marks]

**Solution:**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **J** |
| **A** | - | 7 | 11 | 5 | 8 | 6 | - | - | - | 22 |
| **B** | **7** | - | 7 | 9 | 5 | - | 12 | 13 | - | - |
| **C** | 11 | **7** | - | 25 | 18 | - | - | - | - | 9 |
| **D** | **5** | 9 | 25 | - | 12 | 9 | 6 | 12 | 15 | 14 |
| **E** | 8 | **5** | 18 | 12 | - | - | 9 | 8 | 8 | 12 |
| **F** | **6** | - | - | 9 | - | - | 10 | - | - | - |
| **G** | - | 12 | - | **6** | 9 | 10 | - | 9 | 9 | - |
| **H** | - | 13 | - | 12 | **8** | - | 9 | - | 4 | 12 |
| **I** | - | - | - | 15 | 8 | - | 9 | **4** | - | 10 |
| **J** | 22 | - | **9** | 14 | 12 | - | - | 12 | 10 | - |

<EFOFEX>
id:fxd{2b190f86-3fab-430e-8fd4-a39657753f64}

FXData:

</EFOFEX>

1. <EFOFEX>
   id:fxe{306f00e4-5d18-42ec-8ec1-535e325fa4d7}
   FXGP:
   FXData:
   </EFOFEX>
2. <EFOFEX>
   id:fxe{7bb04ece-54ab-44b9-bba7-a16ef3bff2de}

   FXData:

   </EFOFEX>
3. As the 9m link between C and J cannot be used, the installers must use the next shortest link to J which is from I. The link is 1m longer so adds $15.50 to the cost of the installation. <EFOFEX>
   id:fxe{f0ab3696-f5b0-4c2d-90de-ea3af20453e4}
   FXGP:
   FXData:
   </EFOFEX> <EFOFEX>
   id:fxe{b2f79550-e3ae-4f46-b74d-4cd65987c290}
   FXGP:
   FXData:
   </EFOFEX>