**Comp 2322 Computer Networking**

**Homework Four Solutions**

**Total marks: 10 points**

**Questions:**

1. (4 points) Consider a network using 8-bit host addresses. Suppose a router uses the longest prefix matching and has the following forwarding table:

|  |  |
| --- | --- |
| Prefix Match | Interface |
| 00 | 0 |
| 010 | 1 |
| 011 | 2 |
| 10 | 2 |
| 11 | 3 |

For each of the four interfaces, give the associated range of destination host addresses and the number of addresses in the range.

Ans:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Prefix Match | Interface | Destination Address Range | Number of Addresses | |
| 00 | 0 | 00000000 ~ 00111111 |  | |
| 010 | 1 | 01000000 ~ 01011111 |  | |
| 011 | 2 | 01100000 ~ 01111111 |  | 32+64=96 |
| 10 | 2 | 10000000 ~ 10111111 |  |
| 11 | 3 | 11000000 ~ 11111111 |  | |

1. (1 point) Suppose datagrams are limited to 1,000 bytes (including header) between source Host A and destination Host B due to the link has an MTU of 1000 bytes. Assuming a 20-byte IP header, how many datagrams would be required to send an MP3 file that consists of 5M bytes when using TCP? Explain how you computed your answer.

Ans:

MP3 file size is 5 MBs. Assume the MP3 file is carried in TCP segments, with each TCP segment having 20-byte TCP header and 20-byte IP header, Then each datagram can carry 1000-40=960 bytes of the MP3 file.

Number of datagrams .

1. (5 points) Consider the network below. Please use Dijkstra’s shortest-path algorithm to compute the shortest path from node *a* to all network nodes. Give detailed steps.

2

1

2

8

10

4

1

5

5

4

5

h

g

b

d

a

f

c

e

4

Ans:

Using Dijkstra’s shortest-path algorithm for node *a*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Step | N’ | D(b),p(b) | D(c),p(c) | D(d),p(d) | D(e),p(e) | D(f),p(f) | D(g),p(g) | D(h), p(h) |
| 0 | a | 1,a | 2,a | ∞ | ∞ | ∞ | ∞ | ∞ |
| 1 | ab | 1,a | 2,a | 11,b | ∞ | 9,b | ∞ | ∞ |
| 2 | abc | 1,a | 2,a | 7,c | 6,c | 9,b | ∞ | ∞ |
| 3 | abce | 1,a | 2,a | 7,c | 6,c | 9,b | 11,e | ∞ |
| 4 | abced | 1,a | 2,a | 7,c | 6,c | 9,b | 11,e | ∞ |
| 5 | abcedf | 1,a | 2,a | 7,c | 6,c | 9,b | 10,f | 11,f |
| 6 | abcedfg | 1,a | 2,a | 7,c | 6,c | 9,b | 10,f | 11,f |
| 7 | abcedfgh | 1,a | 2,a | 7,c | 6,c | 9,b | 10,f | 11,f |

Shortest path from node *a* to all networks nodes

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Destination node | a | b | c | d | e | f | g | h |
| Shortest path | a | ab | ac | acd | ace | abf | abfg | abfh |