PARSHVANATH CHARITABLE TRUST'S
A.P. SHAH INSTITUTE OF TECHNOLOGY
Department of Computer Science and Engineering
Data Science

Semester: V **Subject:** Computer Network **Academic Year:** 2023 - 2024

=> The optimality principle.

1. The optimality Principle is which one can make a general statement about optimal routes without regard to network topology or traffic. It states that if router J is on the optimal path from router I to router K, then optimal path from I to K also falls along the same route.
2. The set of optimal routes from all sources to a given destination form a tree rooted at the destination is called a sink tree. In this the distance metric is the no. of hops. The goal of all routing algorithms is to discover and use the sink trees for all routers.
3. Note that a sink tree is not necessarily unique (multiple tree with same length are possible), but a tree without loop. The optimality principle and the sink tree provide a benchmark against which other routing algorithms can be measured.

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TTL & protocol (16 bits) ⇒ 4006.
TTL → 40, Protocol → 006.
checksum (16 bits) ⇒ be16, which is at source side.
This field will be set to zero while computing the checksum at destination end.
source IP address ⇒ 'ac10 0a63'
Destination IP address ⇒ 'ac10 0a0c'.

10). An organization is granted the block 130.34.12.64/26. The organization needs to have four subnets with equal no. of addresses in each subnet. What are the subnet address and the range of addresses for each subnet?

Ans:
No. of addresses for whole o/w = N = $2^{32-26} = 2^6 = 64$.
As 4 subnet has to design so we divide no. of address with no. of sub networks. ie, 64/4 = 16. That means each network has 16 addresses.
New subnet mask will be: For network 2 bits are required ($\log_2 4 = 2$) to add to /26 mask.
So new mask will be 26+2 = 28.

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8) The size option field of an IP datagram is 20 bytes. What is the value of HLEN? What is the value in binary?

Ans: When the HLEN value is 5. This means the total number of bytes in header field is 5. ie 5×4 = 20 bytes. The size of option field of an IP datagram given is 20 bytes.

Hence the total no. of bytes in header should be 40 bytes.
ie = (20 option) + header length (5×4)
∴ the value of HLEN = 10 (10×4), in binary, 1010 ('A' in hex).

9) An IP header from IP packet received at destination
45000032c1c464000 4006b1 e6ac100a 63ac100a Or. Map these values to IP header.

Ans: Version (4 bits) ⇒ 4 (0100)
IHL (Internet header length (4) ⇒ 5 (0101) when no option is specified, header length is 20 bytes.
5×4 = 20.
Type of service (8 bits) ⇒ 00
Total length (16 bits) ⇒ 003c (header + data) = 60 bytes.
header = 20, length of data = 40 bytes.
Identification (16 bits) ⇒ 1c46.
Flags & Fragment offset (16 bits) ⇒ 4000 → divided into 2 bytes
These 2 bytes (divided into 3 bits & 13 bits) corresponds to flags & fragment offset of IP header fields.

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4) An address space has a total of 256 addresses. How many bits are required to represent an address.

Ans: $2^x = 256$, $x = \log_2 256 = 8$.

5) change the following IP address from dotted decimal to binary notation.

a) 129.14.6.8 b) 238.34.54.1

Ans. a) 10000001 00001110 00000101 00001010

b) 11101110 00100010 00000001

6) change the following IP addres. from binary notation to dotted decimal notation.

a) 01111111 11110000 01100111 01111101

b) 10101111 11000000 11111000 00011101

Ans. a) 127.240.103.125

b) 175.192.240.29

7) Find the net id and host id of the following IP address.

a) 212.44.54.10 b) 139.66.8.16 c) 111.54.2.12

Ans. a) class: C, net id: 212.44.54, host id: 10

b) class: B, net id: 139.66, host id: 8.16

c) class: A, net id: 111, host id: 54.2.12

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3rd Module:-

1) Find the errors, if any in the following IPv4 addresses.
a) 123.35.56.78.90 b) 111.49.096.66
c) 11100101.45.67.34 d) 67.56.345.17

Ans: a) There can be no more than 4 numbers.
b) There must be no leading zero (096)
c) A mixture of binary notation and dotted-decimal notation is not allowed.
d) Each number needs to be less than or equal to 255.

2) Find the class of each address.
a) 00000001 00011011 00001011 11101111
b) 11000001 10000011 00011011 11111111
c) 16.23.120.8
d) 252.5.15.111

Ans:
a) The first bit is 0 → class A
b) The first 3 bits are 110 → class C
c) first byte is 16 → class A
d) First byte is 252 → class E.

3) what is the address space in each of the following systems?
a) A system with 4 bit address b) A system with 16 bit address

Ans: a) $2^4 = 16$ addresses b) $2^{16} = 65536$ address.