

Name:

1. What is the main objective of Address Resolution Protocol (ARP)? Explain briefly how it works.

(10 Points)

2. How does the Classless Inter-Domain Routing (CIDR) works? How can CIDR group together a block of IP addresses into a single routing table entry?

(15 Points)

Name:

3. The architecture of first generation routers was similar to a typical computer layout. What are the main shortcomings of this architecture? How these problems are resolved in modern switch based architectures?

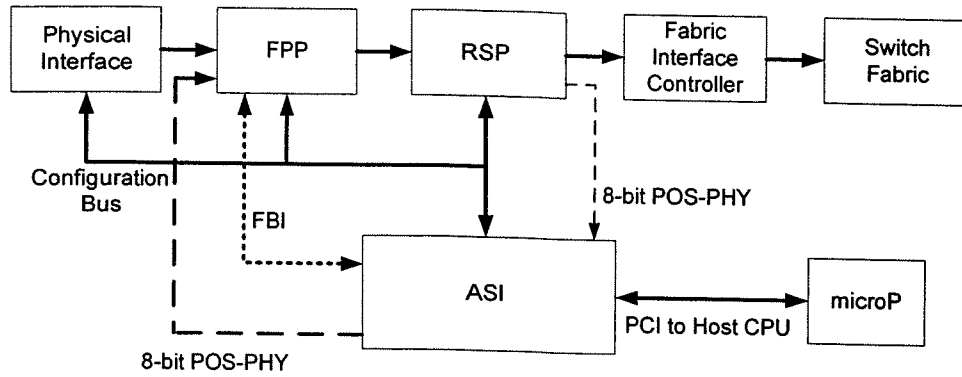
(15 Points)

4. What are the main advantages and shortcomings of using a general purpose RISC processor for Packet Processing?

(10 Points)

Name:

5. The figure shows the general block diagram of Agere 3 chip Network Processor solution.



What are the main functions of 3 chips?

(15 Points)

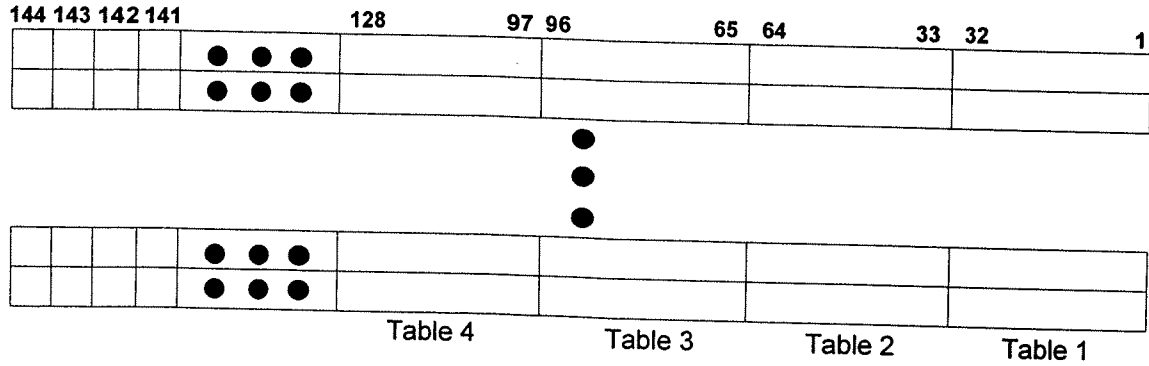
Name:

What is the functionality of 8-bit POS-PHY interface from RSP to ASI and from ASI to FPP?

(5 Points)

Name:

6. Consider a 144 bit-wide TCAM with a priority encoder, where the first entry has the highest priority. We want to use this TCAM for implementing routing table based on CIDR scheme. We arrange the routing table entries in 4 32-bit wide columns of the TCAM as follows:



For each IP packet we first look for a longest prefix match in table 1, if there is no match we check table 2, then table 3 and finally table 4.

If numbers of entries in the four tables are NOT equal how can we make sure that we always get a valid solution? Explain the reasoning behind your design.

(10 Points)

Name:

What should be 144 bits of the global mask register and the comparand register when we want to check table 2?

(10 Points)

How should we arrange the local mask register bits for LPM?

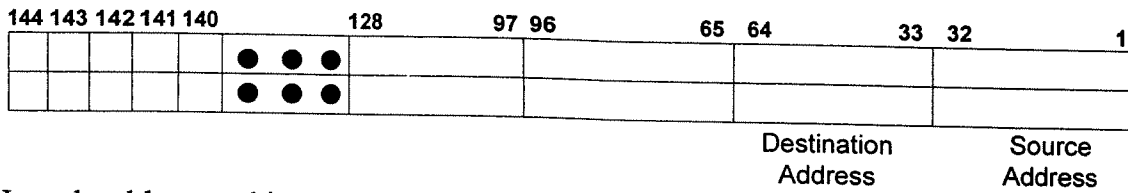
(5 Points)

How should the routing table entries be arranged in the tables starting with the longest prefix entries to the shortest prefix entries? Explain the reasoning behind your design.

(5 Points)

Name:

In addition to the routing table, we want to use TCAM for ACL rule checking. The ACL rules are based on prefix matches on source and destination IP addresses. The TCAM entries for ACL are arranged as follows:



How should we set bits 140 to 144 for proper search results?

(5 Points)

What should be the global mask and comparand register values when we want to search for ACL rules?

(5 Points)

How should we modify the comparand register and global mask register for searching Table 2 of the routing table?

(5 Points)

Denote that you have to make sure that routing table and ACL searches are distinguishable.

Name:

7. We have a CIDR routing table with 7 entries as follows:

P1	0 1 *
P2	0 0 1 *
P3	0 1 0 1 *
P4	0 1 0 1 0 *
P5	0 0 0 *
P6	1 1 0 *
P7	1*

Design a Radix Trie to implement this routing table.
How many memory units we need to implement this trie?
What is the maximum number of memory lookup that we need?

(15 Points)

Design a leaf pushing binary Trie to implement this routing table.
How many memory units we need to implement this trie?
What is the maximum number of memory lookups that we need?

(15 Points)

Name:

8. We want to use the DIPRE algorithm to find entries in a TCAM for a 12 bit intervals.

What is the maximum number of entries that we need for one interval if we use 3-3-3-3 stride (four 3-bit chunks)?

How many bits in each TCAM entry do we need?

(5 Points)

What is the maximum number of entries that we need for one interval if we use 4-4-4 stride (three 4-bit chunks)?

How many bits in each TCAM entry do we need?

(5 Points)

Name:

Suppose that we use the (3-3—3-3) stride and we want to implement the interval $[S=(0\ 3\ 5\ 3)\ E=(4, 2, 4, 5)]$. Determine entries that we need for TCAM.

(20 Points)