Question Paper

Exam Date & Time: 07-May-2024 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH. (INFORMATION TECHNOLOGY) DEGREE EXAMINATIONS - APRIL / MAY 2024
SUBJECT: ICT 2224/ICT_2224 - COMPUTER NETWORKS

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

1A) Consider an organization granted with a block of addresses containing an address 141.14.7.3. The organization needs three subblocks of addresses to assign as follows: (5)
i) First subblock: Requires 83 addresses.
ii) Second subblock: Requires 162 addresses.
iii) Third subblock: Requires 19 addresses.
Assign the IP addresses efficiently for each subblock in the same order as shown above. Find the valid host IP address and broadcast address for each subblock.

1B) Design 8 input and 8 output packet switch based on banyan switching fabric. Draw the configuration diagram. Explain the verification of input port 6 and output port 3. (3)

1C) Compute how the network administrator should divide the subnets and provide each department's subnet mask, network address, and broadcast address based on the scenario given below: (2)
The company has a main office, and it is assigned the network**10.0.0.0/22**. It requires two subnets with the following host requirements:
i) First subblock: Requires 120 hosts.
ii) Second subblock: Requires 90 hosts.

2A) Consider the routing table of router R1 given in **Table.Q2A.** Fill the missing value suitably. Design the topology of the network. If the destination IP address is 201.12.181.1, find the interface and the next hop used to forward in ARP request. Justify the suitably. (5)

Table Q2A: Network Topology

Mask	Network address	Next hop	Interface number
/23	200.12.182.0	-	M1

/23	161.50.82.0	-	M2
/22	201.12.180.0	-	M0
/22	135.49.85.0	Missing value	M0
/20	91.5.40.0	Missing value	M1
Default	Default	Missing value	M2

2B) Considering the following scenario and show all the IP Packets generated by router R1 and R2 for the network shown in **Fig Q2B**. Assume an MTU of 1500 Bytes for network A and 535 bytes for network B respectively. R1 receives an IP packet P directed at H and containing a 2000 bytes TCP segment. IP header is of 20 bytes. Describe the M bit and the Offset field for IP fragments of packet P sent from R1 on network A and R2 over network B. (3)

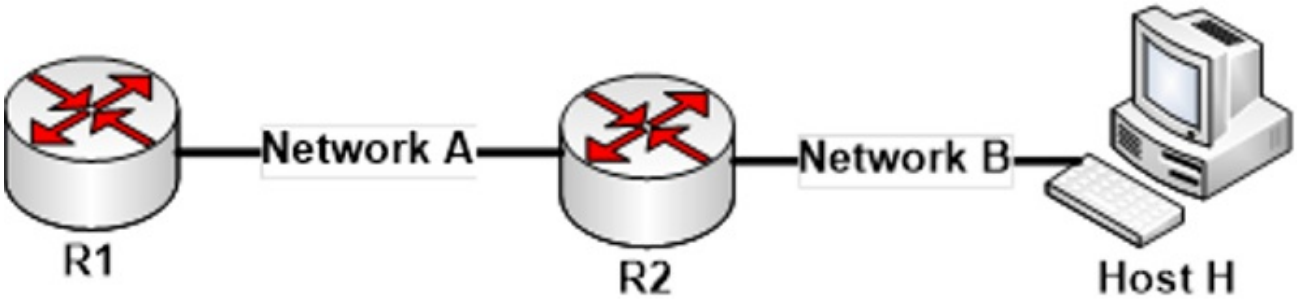

Fig Q2B

2C) Illustrate a visual representation of the network topology using the provided information: (2)
Six networks (N1 to N6) are organized as follows:

- N1, N2, N3, and N4 are Ethernet LANs.
- N5 and N6 are connected via point-to-point WAN links.

Six routers (R1 to R6) are interconnected according to the following connections:

- R1 connects N1 and N2.
- R2 connects N1 and N3.
- R3 connects N2 and N4.
- R4 connects N3 and N5.
- R5 connects N4 and N6.
- R6 connects N5 and N6.

3A) In a city traffic system, intersections are connected by one-way streets with varying travel times (in minutes). The intersections and streets are modelled as a directed graph with the following travel times: (5)

- Intersection 1 -> Intersection 2: 3 min
- Intersection 1 -> Intersection 3: 8 min
- Intersection 2 -> Intersection 4: 1 min
- Intersection 2 -> Intersection 3: -4 min
- Intersection 3 -> Intersection 5: -2 min
- Intersection 4 -> Intersection 5: -1 min

Compute the shortest travel time from Intersection 1 to all other intersections using the Bellman-Ford algorithm.

3B) Demonstrate with a suitable example the occurrence of Silly Window Syndrome due to the behaviour of the sender. How to mitigate this issue? (3)

3C) Compute the RTO time. Assume that the initial RTO is 6ms, first time, measured RTT is 5ms. Second time measured RTT is 9ms. Compute the RTO at both measurements. (2)

4A) A TCP connection is established between two processes P1 and P2 running on different hosts. Segment size is set to 800 bytes for this connection. Initially, the ssthresh at P1 is 7000 bytes. Then, P1 receives a TCP ACK reporting a rwnd size of 4000 bytes. After reception and processing of this ACK, the cwnd value is 7200 bytes. How many maximum-sized segments can P1 transmit now (i.e., after the ACK processing)? (5)

4B)	The following is a DUMP of a UDP header in hexadecimal format. 0632000D001CE217. i. What is source port number? ii. What is destination port number? iii. What is length of user datagram? iv. What is length of the data? v. Is the packet directed from a client to server or vice versa? vi. What is the client process	(3)
4C)	Imagine you're sitting in a café, composing an email on your laptop and sending it to a colleague who works in a different city. Which type of switching would you prefer and explain the same.	(2)
5A)	ARP and DNS both depend on caches; ARP cache entry lifetimes are typically 10 minutes while DNS cache is on the order of days. Justify this difference. What undesirable consequences might there be in having too long a DNS cache entry lifetime?	(5)
5B)	For the following sequence of Hexadecimal digits in a ICMP packet 0800 1234 5678 4865 6c6c 6f2c 2057 6f72 6c64 21. Compute the checksum and show how it is verified at the receiver end.	(3)
5C)	Identify what is the minimum length of a DHCP packet? What is the maximum length?	(2)

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