CONFIDENTIAL STIJ3044

UNIVERSITI UTARA MALAYSIA

FINAL EXAMINATION
FIRST SEMESTER 2009/2010 SESSION

CODE/COURSE : STIJ3044/ROUTING PROTOCOLS AND CONCEPT
DATE : 1 NOVEMBER 2009 (SUNDAY)
TIME : 9.00 – 11.30 AM
VENUE : DTSO

INSTRUCTIONS:

1. This exam paper contains FIFTEEN (15) questions in TEN (10) printed pages, excluding the cover page.
2. You are required to answer ALL the questions on the spaces provided on the exam paper.

MATRIC NO.: ___________________________ (in words) ___________________________ (in figures)
IDENTITY CARD NO.: ___________________________
LECTURER : ___________________________
GROUP : _______  TABLE NO.: ___________

DO NOT OPEN THE PAGE UNTIL YOU ARE TOLD TO DO SO
Structured Questions (100 marks)
Answer ALL questions in the space provided.

1. State type of cables used to connect the devices in the topology diagram in Figure 1.
   (4 marks)

   ![Figure 1](image_url)

   a) Between PC1 and switch - __________________________
   b) Between Switch and R1 - __________________________
   c) Between R1 and R2 - __________________________
   d) Between R2 and PC2 - __________________________

2. Diagram in Figure 2 shows the bootup process of a router. Label the hardware component involves in the process.

   ![Figure 2](image_url)

   Hardware
   a) __________________________
   b) __________________________
   c) __________________________
   d) __________________________
   e) __________________________
   f) __________________________
   g) __________________________

   How a Router Boots Up
   1. Perform POST
   2. Execute Bootstrap Loader
   3. Locate the IOS
   4. Load the IOS
   5. Locate the Configuration File
   6. Execute the Configuration File...or enter "setup" mode

   (7 marks)
3. State **THREE(3)** functions of a router.  

(3 marks)

4. Refer to Figure 3. Assign IP address to all router interfaces and PCs. Assign the first valid or usable host addresses to interfaces on R1 and the last valid addresses to interfaces on R2. PC1 and PC2 can be assigned any usable host addresses.

![Figure 3](image)

**Answer:**

<table>
<thead>
<tr>
<th>Device</th>
<th>Interface</th>
<th>IP Address</th>
<th>Subnet Mask</th>
<th>Default Gateway</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Fa0/0</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>S0/0/0</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>R2</td>
<td>Fa0/0</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>S0/0/0</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>PC1</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PC2</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(7 marks)

5. State the **THREE(3)** processes a router executes when it receives a packet from one network that is destined for another network.  

(6 marks)
6. Hosts on two separate subnets cannot communicate. The network administrator suspects a missing route in one of the routing tables. Write **THREE(3)** commands that can be used to help troubleshoot Layer 3 connectivity issues.

   (3 marks)

7. Dynamic routing has several advantages over static routing. However, static routing is still used in networks today. In fact, networks typically use a combination of both static and dynamic routing. Compare dynamic routing versus static routing by completing the following comparison table.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Dynamic Routing</th>
<th>Static Routing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Complexity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topology Changes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scaling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource Usage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   (5 marks)
8. The output of the Router# `show interfaces serial 0/1` command displays the following:

   \[ \text{Serial 0/1 is up, line protocol is down.} \]

   State \text{TWO(2)} causes for the line protocol being down. \hspace{1cm} (4 \text{ marks})

9. Write the proper `show/debug` commands to the following outputs.

<table>
<thead>
<tr>
<th>OUTPUTS</th>
<th>COMMANDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display all known networks</td>
<td></td>
</tr>
<tr>
<td>Display detailed port information</td>
<td></td>
</tr>
<tr>
<td>Display routing troubleshooting information</td>
<td></td>
</tr>
<tr>
<td>Display basic port information</td>
<td></td>
</tr>
<tr>
<td>Display directly connected routers</td>
<td></td>
</tr>
<tr>
<td>Display DTE/DCE information</td>
<td></td>
</tr>
</tbody>
</table>

   \hspace{1cm} (6 \text{ marks})

10. Dynamic interior gateway routing protocols can be classified into distance vector and link-state.

   a) Define the meaning of distance vector and link-state. \hspace{1cm} (4 \text{ marks})
b) State **FOUR** characteristics of distance vector routing protocols.

(4 marks)

11. A routing loop can occur when two or more routers have routing information that incorrectly indicates that a valid path to an unreachable destination exists.
   a) Explain **THREE** conditions that can be created by the routing loop.

(6 marks)

b) Explain **THREE (3)** ways or methods to help prevent routing loops.

(6 marks)
12. A network administrator is evaluating RIP versus EIGRP for a new network. The network will be sensitive to congestion and must respond quickly to topology changes. What are **TWO(2)** good reasons to choose EIGRP instead of RIP in this case?

(4 marks)

13. Name the **THREE(3)** different types of OSPF Link-State Packets (LSPs).

(3 marks)


(4 marks)

15. You are given the output from ROUTER 1, ROUTER 2, ROUTER 3, ROUTER 4 and ROUTER 5. Determine the topology of a network using the outputs from the `show ip route` command. Answer the following question based on the outputs.

```
ROUTER1#show ip route

Gateway of last resort is not set

10.0.0.0/30 is subnetted, 4 subnets
R 10.10.10.0 [120/1] via 10.10.10.6, 00:00:09, Serial0/0/0
C 10.10.10.4 is directly connected, Serial0/0/0
C 10.10.10.8 is directly connected, Serial0/0/1
R 10.10.10.12 [120/1] via 10.10.10.10, 00:00:09, Serial0/0/1
172.16.0.0/16 is variably subnetted, 10 subnets, 5 masks
C 172.16.1.0/27 is directly connected, FastEthernet0/0
```
R 172.16.1.32/28 [120/2] via 10.10.10.10, 00:00:09, Serial0/0/1
R 172.16.1.192/26 [120/1] via 10.10.10.6, 00:00:09, Serial0/0/0
R 172.16.2.6/26 [120/2] via 10.10.10.6, 00:00:09, Serial0/0/0
R 172.16.2.64/27 [120/1] via 10.10.10.10, 00:00:09, Serial0/0/1
C 172.16.3.0/25 is directly connected, FastEthernet0/1
R 172.16.3.128/26 [120/1] via 10.10.10.6, 00:00:09, Serial0/0/0
R 172.16.3.192/29 [120/2] via 10.10.10.6, 00:00:09, Serial0/0/0
R 172.16.4.0/27 [120/1] via 10.10.10.10, 00:00:09, Serial0/0/1
R 172.16.4.128/25 [120/2] via 10.10.10.10, 00:00:09, Serial0/0/1
C 192.168.1.0/24 is directly connected, Loopback0
S* 0.0.0.0/0 is directly connected, Loopback0

ROUTER2#show ip route

Output omitted

Gateway of last resort is 10.10.10.2 to network 0.0.0.0
10.0.0.0/30 is subnetted, 4 subnets
C 10.10.10.0 is directly connected, Serial0/0/0
R 10.10.10.4 [120/1] via 10.10.10.2, 00:00:04, Serial0/0/0
R 10.10.10.8 [120/2] via 10.10.10.2, 00:00:04, Serial0/0/0
R 10.10.10.12 [120/3] via 10.10.10.2, 00:00:04, Serial0/0/0
172.16.0.0/16 is variably subnetted, 10 subnets, 5 masks
R 172.16.1.0/27 [120/2] via 10.10.10.2, 00:00:04, Serial0/0/0
R 172.16.3.32/28 [120/4] via 10.10.10.2, 00:00:04, Serial0/0/0
R 172.16.1.192/26 [120/1] via 10.10.10.2, 00:00:04, Serial0/0/0
C 172.16.2.0/26 is directly connected, FastEthernet0/0
R 172.16.2.64/27 [120/3] via 10.10.10.2, 00:00:04, Serial0/0/0
R 172.16.3.0/25 [120/2] via 10.10.10.2, 00:00:04, Serial0/0/0
R 172.16.3.128/26 [120/1] via 10.10.10.2, 00:00:04, Serial0/0/0
C 172.16.3.192/29 is directly connected, FastEthernet0/1
R 172.16.4.0/27 [120/3] via 10.10.10.2, 00:00:04, Serial0/0/0
R 172.16.4.128/25 [120/4] via 10.10.10.2, 00:00:04, Serial0/0/0
R 192.168.1.0/24 [120/2] via 10.10.10.2, 00:00:04, Serial0/0/0
R* 0.0.0.0/0 [120/2] via 10.10.10.2, 00:00:04, Serial0/0/0

ROUTER3#show ip route

Output omitted

Gateway of last resort is 10.10.10.5 to network 0.0.0.0
10.0.0.0/30 is subnetted, 4 subnets
C 10.10.10.0 is directly connected, Serial0/0/1
C 10.10.10.4 is directly connected, Serial0/0/0
R 10.10.10.8 [120/1] via 10.10.10.5, 00:00:04, Serial0/0/0
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R 10.10.10.12 [120/2] via 10.10.10.5, 00:00:04, Serial0/0/0
172.16.0.0/16 is variably subnetted, 10 subnets, 5 masks
R 172.16.1.0/27 [120/1] via 10.10.10.5, 00:00:04, Serial0/0/0
R 172.16.1.32/28 [120/3] via 10.10.10.5, 00:00:04, Serial0/0/0
C 172.16.1.192/26 is directly connected, FastEthernet0/1
R 172.16.2.0/26 [120/1] via 10.10.10.1, 00:00:03, Serial0/0/1
R 172.16.2.64/27 [120/2] via 10.10.10.5, 00:00:04, Serial0/0/0
R 172.16.3.0/25 [120/1] via 10.10.10.5, 00:00:04, Serial0/0/0
C 172.16.3.128/26 is directly connected, FastEthernet0/0
R 172.16.3.192/29 [120/1] via 10.10.10.1, 00:00:03, Serial0/0/1
R 172.16.4.0/27 [120/2] via 10.10.10.5, 00:00:04, Serial0/0/0
R 172.16.4.128/25 [120/3] via 10.10.10.5, 00:00:04, Serial0/0/0
R 192.168.1.0/24 [120/1] via 10.10.10.5, 00:00:04, Serial0/0/0
R* 0.0.0.0/0 [120/1] via 10.10.10.5, 00:00:04, Serial0/0/0

ROUTER4#show ip route

Output omitted

Gateway of last resort is 10.10.10.9 to network 0.0.0.0
10.0.0.0/30 is subnetted, 4 subnets
R 10.10.10.0 [120/2] via 10.10.10.9, 00:00:14, Serial0/0/0
R 10.10.10.4 [120/1] via 10.10.10.9, 00:09:14, Serial0/0/0
C 10.10.10.8 is directly connected, Serial0/0/0
C 10.10.10.12 is directly connected, Serial0/0/1
172.16.0.0/16 is variably subnetted, 10 subnets, 5 masks
R 172.16.1.0/27 [120/1] via 10.10.10.9, 00:00:14, Serial0/0/0
R 172.16.1.32/28 [120/3] via 10.10.10.14, 00:00:17, Serial0/0/1
R 172.16.1.192/26 [120/2] via 10.10.10.9, 00:00:14, Serial0/0/0
R 172.16.2.0/26 [120/3] via 10.10.10.9, 00:00:14, Serial0/0/0
C 172.16.2.64/27 is directly connected, FastEthernet0/1
R 172.16.3.0/25 [120/1] via 10.10.10.9, 00:00:14, Serial0/0/0
R 172.16.3.128/26 [120/2] via 10.10.10.9, 00:00:14, Serial0/0/0
R 172.16.3.192/29 [120/3] via 10.10.10.9, 00:00:14, Serial0/0/0
C 172.16.4.0/27 is directly connected, FastEthernet0/0
R 172.16.4.128/25 [120/1] via 10.10.10.14, 00:00:17, Serial0/0/0
R 192.168.1.0/24 [120/1] via 10.10.10.9, 00:00:14, Serial0/0/0
R* 0.0.0.0/0 [120/1] via 10.10.10.9, 00:00:14, Serial0/0/0

ROUTER5#show ip route

Output omitted

Gateway of last resort is 10.10.10.13 to network 0.0.0.0
10.0.0.0/30 is subnetted, 4 subnets
R 10.10.10.0 [120/3] via 10.10.10.13, 00:00:21, Serial0/0/0
R 10.10.10.4 [120/2] via 10.10.10.13, 00:00:21, Serial0/0/0
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R 10.10.10.8 [120/1] via 10.10.10.13, 00:00:21, Serial0/0/0
C 10.10.10.12 is directly connected, Serial0/0/0
172.16.0.0/16 is variably subnetted, 10 subnets, 5 masks
R 172.16.1.0/27 [120/2] via 10.10.10.13, 00:00:21, Serial0/0/0
C 172.16.1.32/28 is directly connected, FastEthernet0/1
R 172.16.1.192/26 [120/3] via 10.10.10.13, 00:00:21, Serial0/0/0
R 172.16.2.0/26 [120/4] via 10.10.10.13, 00:00:21, Serial0/0/0
R 172.16.2.64/27 [120/1] via 10.10.10.13, 00:00:21, Serial0/0/0
R 172.16.3.0/25 [120/2] via 10.10.10.13, 00:00:21, Serial0/0/0
R 172.16.3.128/26 [120/3] via 10.10.10.13, 00:00:21, Serial0/0/0
R 172.16.3.192/29 [120/4] via 10.10.10.13, 00:00:21, Serial0/0/0
R 172.16.4.0/27 [120/1] via 10.10.10.13, 00:00:21, Serial0/0/0
C 172.16.4.128/25 is directly connected, FastEthernet0/0
R 192.168.1.0/24 [120/2] via 10.10.10.13, 00:00:21, Serial0/0/0
R* 0.0.0.0/0 [120/2] via 10.10.10.13, 00:00:21, Serial0/0/0

a) Draw a diagram of the network based on your interpretation of the router outputs in the space provided below. Label all the necessary interfaces and the subnet address on each LAN and WAN link.

(15 marks)
b) Determine router interface addressing based on outputs from above by completing the following Addressing Table.

<table>
<thead>
<tr>
<th>Device</th>
<th>Interface</th>
<th>IP Address</th>
<th>Subnet Mask</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Loopback 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FastEthernet 0/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FastEthernet 0/1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Serial 0/0/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Serial 0/0/1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>Serial 0/0/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FastEthernet 0/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FastEthernet 0/1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>Serial 0/0/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Serial 0/0/1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FastEthernet 0/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FastEthernet 0/1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R4</td>
<td>Serial 0/0/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Serial 0/0/1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FastEthernet 0/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FastEthernet 0/1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R5</td>
<td>Serial 0/0/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FastEthernet 0/0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FastEthernet 0/1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(9 marks)