ACN Midterm

Instructions to Candidates:

Answer **ALL** questions and provide your details below.

STUDENT'S DECLARATION OF ORIGINALITY

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Course Code:	BMIT3094
Course Title:	ADVANCED COMPUTER NETWORKS
Signature:	
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100/100

Class : RSD3 G5

① static route - subnet mask
② ospf - wild card mask
③ ACL - wildcard mask

Question 1

configure remote network

A network topology with IPv4 addressing is shown in Figure 1 and you are required to configure various types of static routes. Answer the following questions to ensure successful communications between all networks, PC0, PC1 and Ext_server.

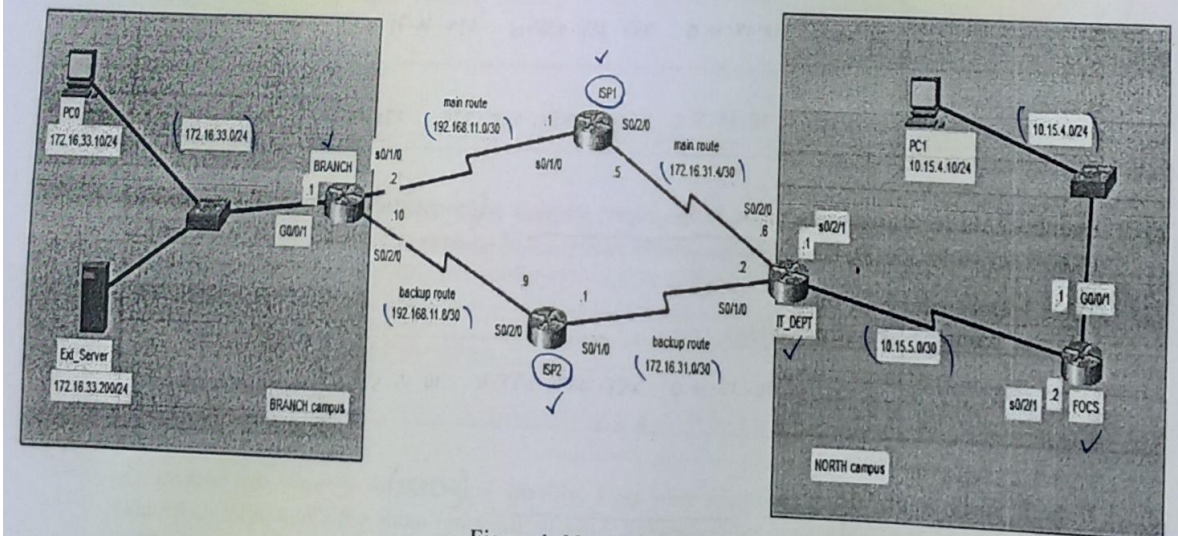

Figure 1: Network Topology

128 125
192 126
224 127
240 128
248 129
252 130
254 131
255 132

a) **Standard static routes** using the **next hop ipv4 address** in **ISP1** to forward the packets to **NORTH** campus and **BRANCH** campus networks respectively. Specify the router name(s) with your configuration(s) in Table 1. (10 marks)

Table 1: Documentation Table

Router name	Configurations
ISP1	ip route 172.16.33.0 255.255.255.0 192.168.11.2
ISP1	ip route 10.15.4.0 255.255.255.0 172.16.31.6
ISP1	ip route 10.15.5.0 255.255.255.252 172.16.31.6

b) **Standard static routes** using the **next hop ipv4 address** in **ISP2** to forward the packets to **NORTH** campus and **BRANCH** campus networks respectively. Specify the router name(s) with your configuration(s) in Table 2. (10 marks)

Table 2: Documentation Table

Router name	Configurations
ISP2	ip route 172.16.33.0 255.255.255.0 192.168.11.10
ISP2	ip route 10.15.4.0 255.255.255.0 172.16.31.2
ISP2	ip route 10.15.5.0 255.255.255.252 172.16.31.2

c) **Standard static routes** using the **next hop ipv4 address** in **IT_DEPT** to forward the packets to **FOCS** network. Specify the router name with your configuration(s) in Table 3. (4 marks)

Table 3: Documentation Table

Router name	Configurations
IT_DEPT	ip route 10.15.4.0 255.255.255.0 10.15.5.2

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d) **Default static route** (quad-zero) using the **next hop ipv4 address** in **FOCS** to forward the packets via **IT_DEPT** network to the BRANCH network. Specify the router name with your configuration(s) in Table 4. (4 marks)

Table 4: Documentation Table

Router name	Configurations
FOCS	ip route 0.0.0.0 0.0.0.0 10.15.5.1

e) **Default static route** and **Floating default static route** using the **next hop ipv4 address** in **IT-DEPT** to forward the packets to **ISP1 (main route) and ISP2 (backup route)** respectively.

(i) Specify the router name with the floating default static routes using next hop ipv4 address configuration(s) in Table 5. (5 marks)

Table 5: Documentation Table

Router name	Configurations
IT-DEPT	ip route 0.0.0.0 0.0.0.0 172.16.31.5 — default static route ISP1 (main route)
IT-DEPT	ip route 0.0.0.0 0.0.0.0 172.16.31.1 88 — floating default static route ISP2 (backup route)

(ii) Illustrate the purpose of configuring a floating default static route in Figure 1. (4 marks)

- the purpose of configuring a floating default static route is to provide a backup default static route in case the primary default static route fail.
- The floating static route is configured with a higher administrative distance (AD) than the AD of default static route (by default the AD is 1)
- the lower the AD, the higher trustworthiness the route and it will be chosen to route the packet. This is because
- In conclusion, its purpose it to ensure the routing process still can be carried out smoothly even though the primary default static route failed.

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f) **Default static route** and **Floating default static route** using the **next hop ipv4 address** in **BRANCH** to forward the packets to **ISP1 (main route) and ISP2 (backup route)** respectively. Specify the router name with your configuration(s) in Table 6. (5 marks)

Table 6: Documentation Table

Router name	Configurations
BRANCH	ip route 0.0.0.0 0.0.0.0 192.168.11.1 — ISP1 (main route) default static route
BRANCH	ip route 0.0.0.0 0.0.0.0 192.168.11.9 88 — ISP2 (backup route) floating default static route

g) (i) Propose the configurations using **Fully specified static route** in Figure 2. Specify the router name with your configuration(s) in Table 7. (5 marks)

exit interface + next-hop ipv4 address
↳ remote network

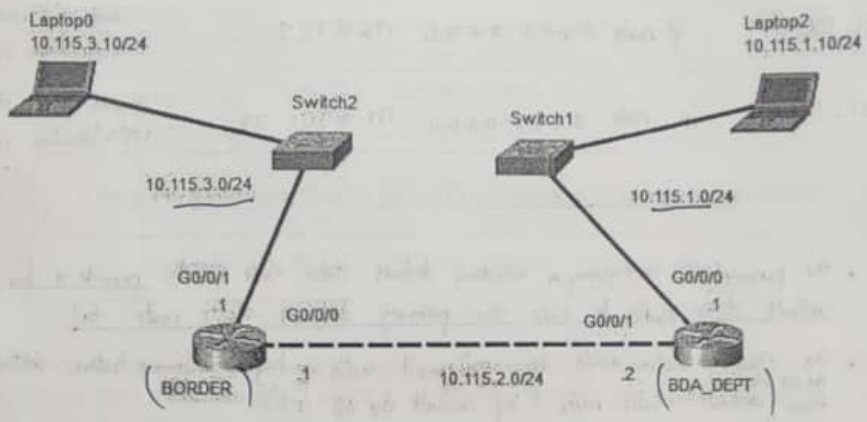

Figure 2: Network Topology

Table 7: Documentation Table

Router name	Configurations
BORDER	ip route 10.115.1.0 255.255.255.0 g0/0/0 10.115.2.2
BDA_DEPT	ip route 10.115.3.0 255.255.255.0 g0/0/1 10.115.2.1

(ii) Justify your proposal on **fully specified static route** configurations in Question 1 g)(i). (3 marks)

- A fully specified static route must used in question 1 (g) (i) because figure 2 network topology it a multiaccess network or network shared topology such as Ethernet with the existence of switches.
- We can elimate recursive lookup routing by using directly connected static route, however the router does not know which next-hop IPv4 address to hop with because the switch enable multi-access network and the router only have exit interface info.
- Hence, a fully specified static route with exit interface and next-hop address specified together can ensure the router know where the packet should route to without any error in a multi-access network topology.

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-1

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BMIT3094 ADVANCED COMPUTER NETWORKS
Question 2

a) Describe a ransomware attack. (6 marks)

- A ransomware is a malware and this attack is carried out by threat actor to deny user access to the computer files by encrypting the files and show the ransom demanding message to the victim.
- If the victim does not back up the computer files properly, they must pay the ransom to threat actor in order to decrypt the computer files and regain access to the computer files and folders.
- The demand ransom format usually is in crypto currencies such as Bitcoin in order to make the tracking process become difficult.

b) A network engineer has setup a network topology as shown in Figure 2.

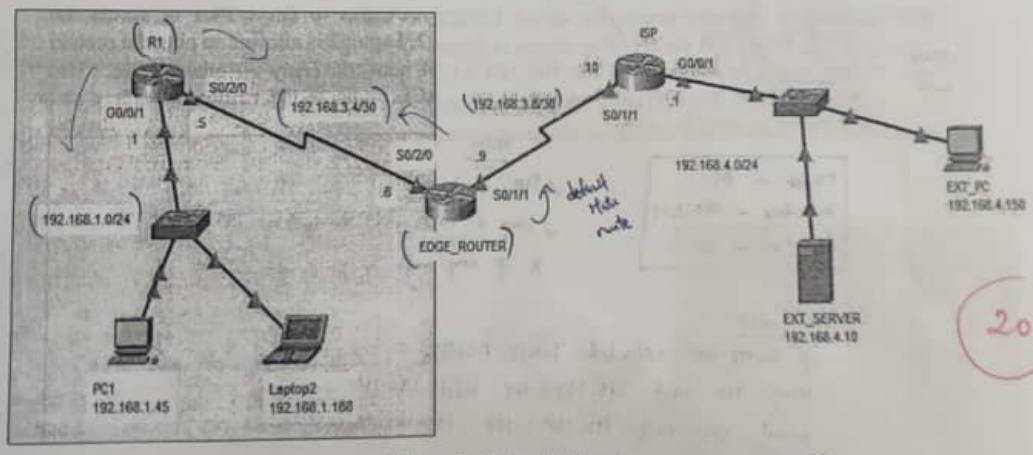

Figure 2: Network Topology

(i) Configure OSPF using network statements in **R1** and **EDGE_ROUTER** routers with OSPF process-id (4949) and area-id (0) Propagate the default route in EDGE_ROUTER to R1. Use Table 8 to document your answer.

Table 8: Documentation Table

Router name	OSPF configurations
R1	router ospf 4949 network 192.168.3.4 0.0.0.3 area 0 network 192.168.1.0 0.0.0.255 area 0 passive-interface g0/0/1
EDGE-ROUTER	router ospf 4949 network 192.168.3.4 0.0.0.3 area 0 default-information originate

before that, the EDGE-ROUTER is configured with default static route using exit-interface
ip route 0.0.0.0 0.0.0.0 S0/1/1

(14 marks)

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(ii) Write an access list numbered **26** to allow PC1 to (telnet) into R1 as shown in Figure 2. Deny all other telnet traffic to R1. Use keyword in your ACL. Indicate the **router, interface** and **direction** to apply the ACL. (13 marks)

router - R1
interface - line vty 0 4
direction - In

✓ host 192.168.1.45
✗ any

commands
access-list 26 permit host 192.168.1.45
access-list 26 deny any
R1
line vty 0 4
access-class 26 In

source - PC1
destination - EXT-SERVER

near the source

80 (tcp)

(iii) Write an extended access list called **LIMIT_ACCESS** to allow **PC1** to access the **EXT_SERVER** via HTTP as shown in Figure 2. Laptop2 is allowed to ping the second half usable ip addresses of the 192.168.4.0/24 network. Deny all other traffic. Use keyword host, any and port number in your ACL. Indicate the **router, interface** and **direction** to apply the ACL. (17 marks)

router - R1
interface - G0/0/1
direction - In

✓ tcp host 192.168.1.45 host 192.168.4.10 eq 80
✓ icmp host 192.168.1.188 192.168.4.128 0.0.0.127
✗ ip any any

commands
ip access-list extended LIMIT-ACCESS
permit tcp host 192.168.1.45 host 192.168.4.10 eq 80
permit icmp host 192.168.1.188 192.168.4.128 0.0.0.127
deny ip any any
R1
int g0/0/1
ip access-group LIMIT-ACCESS In

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Q2 50

May 2022

a) As a network associate, you have been consulted to provide solutions to a network topology with the Internet Protocol version 6 (IPv6) addressing and configurations in all routers interfaces and Personal Computers (PCs) as shown in Figure 1-1.

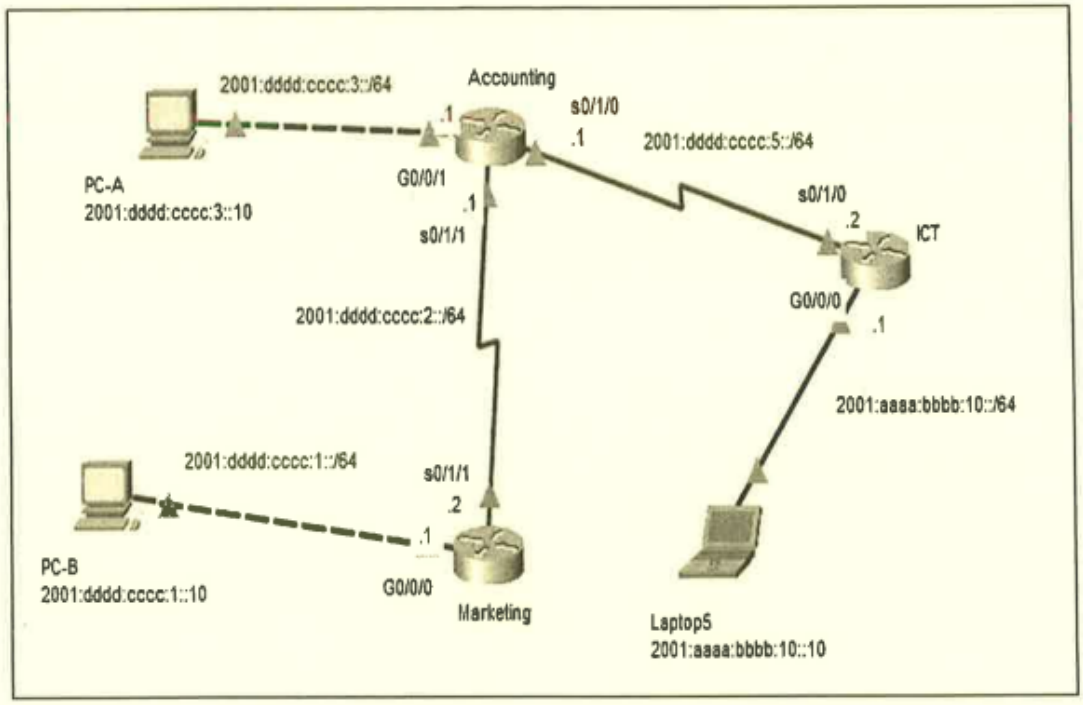

Figure 1-1: A network topology

Analyze and propose IPv6 standard static routes using **next hop IP address** configurations in all routers shown in Figure 1-1. Use Table 1-1 to document your answer. This is to provide communications between PC-A, PC-B and Laptop5.

(13 marks)

Router name	Static route configurations
Marketing	ipv6 unicast-routing ipv6 route 2001:dddd:cccc:5::/64 2001:dddd:cccc:2::1 ipv6 route 2001:dddd:cccc:3::/64 2001:dddd:cccc:2::1 ipv6 route 2001:aaaa:bbbb:10::/64 2001:dddd:cccc:2::1
Accounting	ipv6 unicast-routing ipv6 route 2001:dddd:cccc:1::/64 2001:dddd:cccc:2::2 ipv6 route 2001:aaaa:bbbb:10::/64 2001:dddd:cccc:5::2
ICT	ipv6 unicast-routing ipv6 route 2001:dddd:cccc:1::/64 2001:dddd:cccc:5::1 ipv6 route 2001:dddd:cccc:2::/64 2001:dddd:cccc:5::1 ipv6 route 2001:dddd:cccc:3::/64 2001:dddd:cccc:5::1

b) (i) Examine the network topology in Figure 1-2 and determine Open Shortest Path First (OSPF) configurations using network commands in AQUARIUS and CAPRICORN routers to allow PC11, Laptop33 and External_Laptop to communicate with each other. Use OSPF process-id 655 and area-id 0. Assume default route had been configured in the edge router. Use Table 1-2 to document your answer.

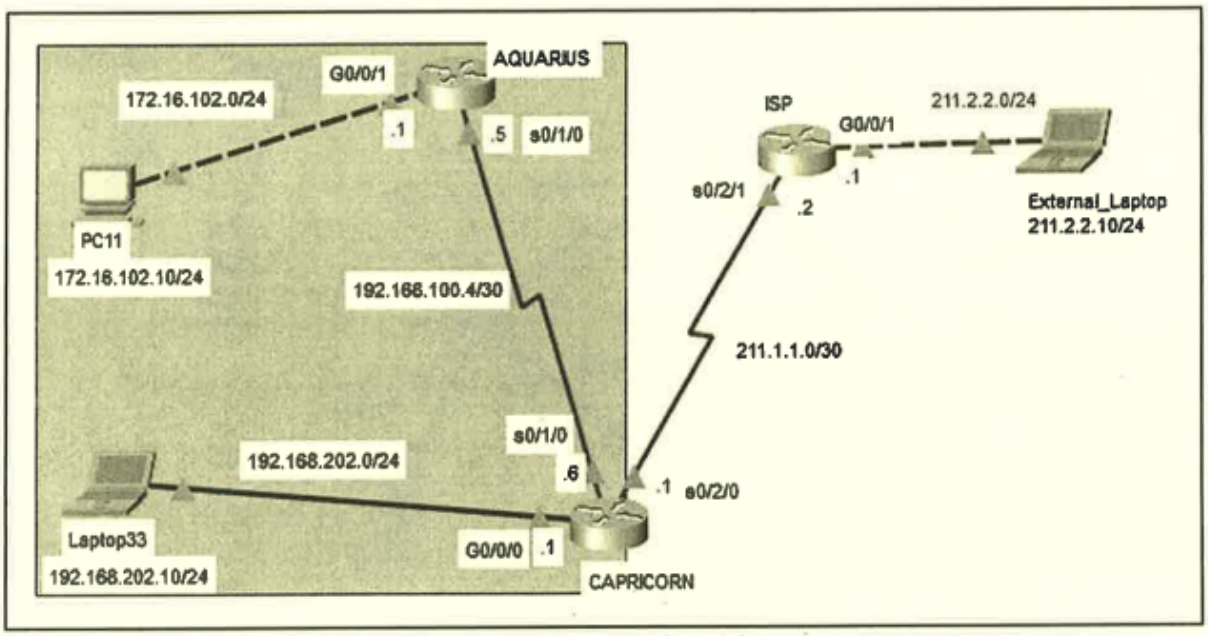

Figure 1-2: A network topology

Router name	**OSPF configurations**
AQUARIUS	router ospf 655 network 172.16.102.0 0.0.0.255 area 0 network 192.168.100.4 0.0.0.3 area 0
CAPRICORN	router ospf 655 default-information originate network 192.168.202.0 0.0.0.255 area 0 network 192.168.100.4 0.0.0.3 area 0

(ii) Configure a default static route and standard static routes using exit interfaces in the respective routers to enable PC11, Laptop33 and External_Laptop communications. Use Table 1-3 to document your answer.

	Router name	**Configurations**
Default static route	CAPRICORN	ip route 0.0.0.0 0.0.0.0 s0/2/0
Standard static route	ISP	ip route 172.16.102.0 255.255.255.0 s0/2/1 ip route 192.168.202.0 255.255.255.0 s0/2/1

Question 2

a) Illustrate the differences between asymmetric and symmetric encryption. (4 marks)

Asymmetric encryption	**Symmetric encryption**
Use public key and private key for encryption and decryption	Use shared secret key for encryption and decryption
Fast encryption as it is based on simple mathematical operations	Slower encryption as it is based on complex computational algorithms
RSA	AES, DES

b) Access Control List (ACLs) are to be applied to the router's interface to secure the network.

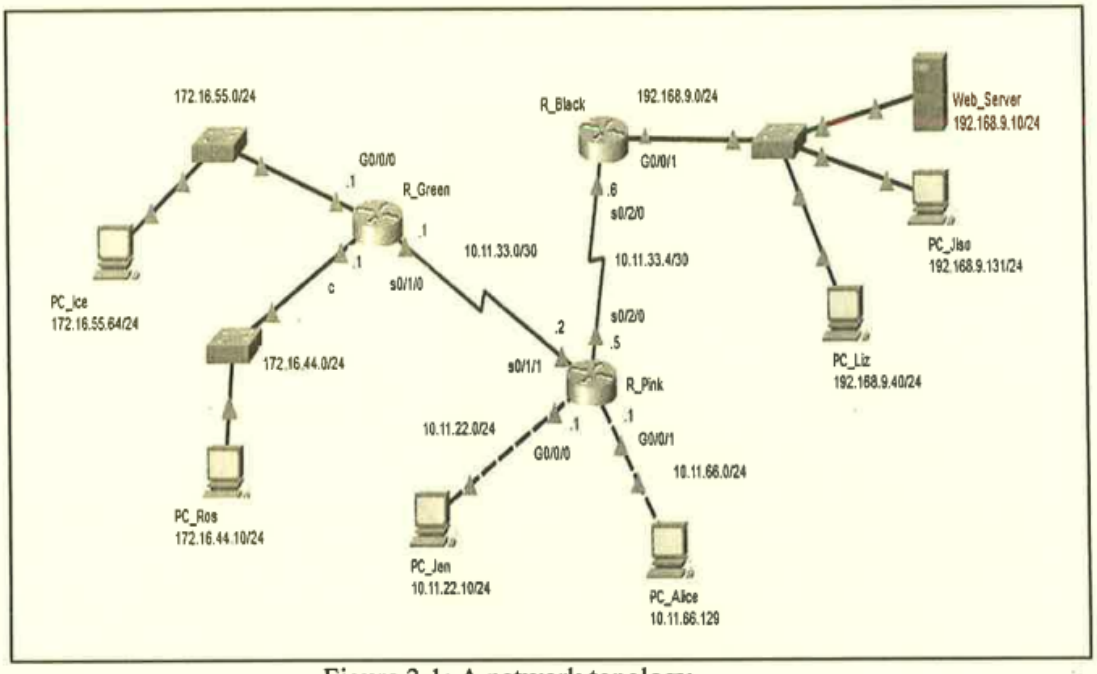

Figure 2-1: A network topology

OSPF configurations are completed in all routers and all PCs can communicate with each other. Analyze Figure 2-1 and answer the following questions.

(i) Write an access list named **TELNET_NET** to allow PC_Jen to telnet into R_Pink router. Deny all other telnet traffic to R_Pink which must be explicitly written in your Access Control List (ACL). Use suitable keyword(s) in the ACL. Indicate the router, interface, and direction to apply the ACL. (6 marks)

Router: R_Pink
Interface: g0/0/0
Direction: in

configurations

```
ip access-list standard TELNET_NET
permit host 10.11.22.10
deny any

line vty 0 4
access-class TELNET_NET in
```

(ii) Write an extended access list numbered **107** to block PC_Ros from accessing Web_Server for FTP services. Block the lower half of the addresses in the 172.16.55.0 network to reach the Web_Server for HTTP services. Block the lower half of the addresses in the 172.16.55.0 network to reach the upper half of the addresses in the 192.168.9.0 network for ICMP services. Permit all other traffics. Use suitable keyword(s) in your ACL. Indicate the router, interface and direction to apply the ACL. (15 marks)

[Total: 25 marks]

Notes
x tcp host 172.16.44.10 host 192.168.9.10 eq 21
x tcp 172.16.55.0 0.0.0.127 host 192.168.9.10 eq 80
x icmp 172.16.55.0 0.0.0.127 192.168.9.128 0.0.0.127
permit ip any any

Answer
Router: R_Green
Interface: s0/1/0
Direction: out

Configurations
access-list 107 deny tcp host 172.16.44.10 host 192.168.9.10 eq 21
access-list 107 deny tcp 172.16.55.0 0.0.0.127 host 192.168.9.10 eq 80
access-list 107 icmp 172.16.55.0 0.0.0.127 192.168.9.128 0.0.0.127
permit ip any any

R_Green
int s0/1/0
ip access-group 107 out

Question 3

A network topology with IPv4 addressing, OSPF configurations and static routing were configured in the respective routers in Figure 3-1 network topology. All PCs are able to communicate with each other. Refer to Figure 3-1, answer the following questions.

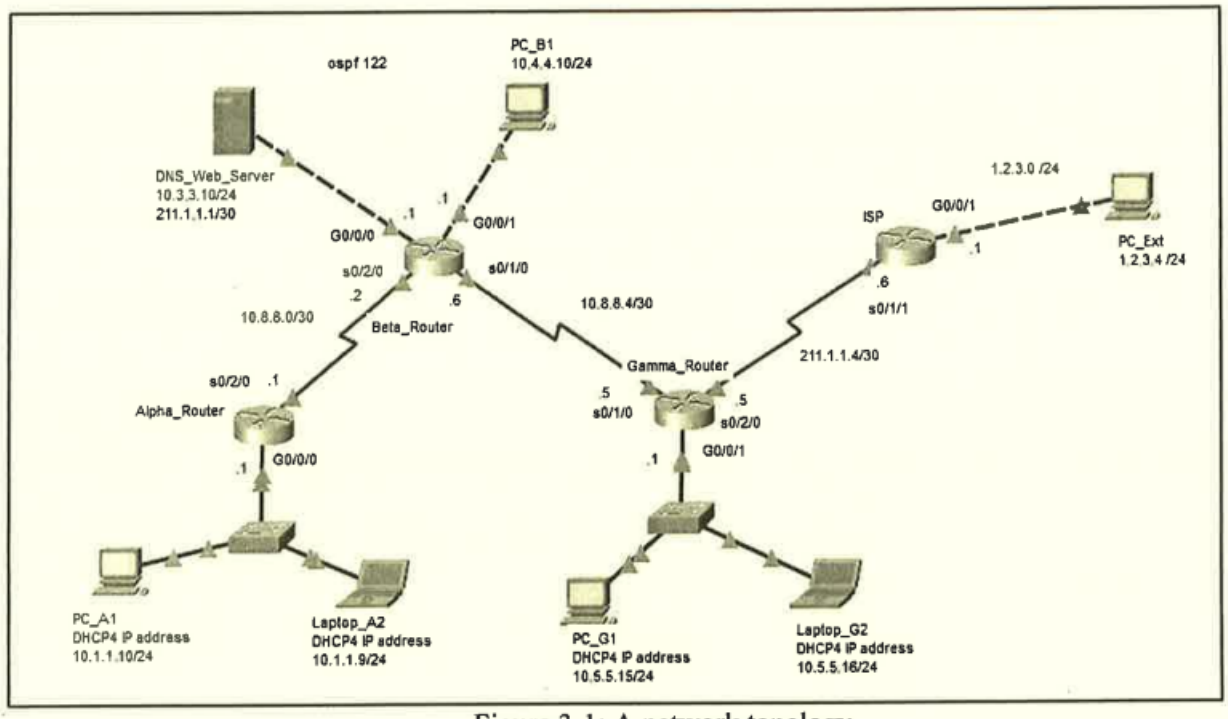

Figure 3-1: A network topology

a) Alpha_Router is the DHCP (Dynamic Host Configuration Protocol) server. PC_A1, Laptop_A2, PC_G1 and Laptop_G2 should obtain the IP addresses and other DHCP configurations automatically from Alpha_Router as shown in Figure 3-1. DHCP pool names are ALPHA_DHCP and GAMMA_DHCP respectively. Use Table 3-1 to document the DHCP configurations with justifications. (14 marks)

Router name	**Configurations**	**Justifications**
Alpha_Router	ip dhcp excluded 10.1.1.1 10.1.1.8 ip dhcp pool ALPHA_DHCP network 10.1.1.0 255.255.255.0 default-router 10.1.1.1 dns-server 10.3.3.10 ip dhcp excluded 10.5.5.1 10.5.5.14 ip dhcp pool GAMMA_DHCP network 10.5.5.0 255.255.255.0 default-router 10.5.5.1 dns-server 10.3.3.10	You justify it

Gamma_Router	int g0/0/1 ip helper-address 10.1.1.1	You justify it

b) (i) Analyze Figure 3-1 and write a Static NAT configuration in order for DNS_Web_Server to be directly reachable from the Internet. Specify the router to implement Static NAT. (3 marks)

Edge router: Gamma router
ip static inside source static 10.3.3.10 211.1.1.1

(ii) Examine Figure 3-1 and write the configurations for Port Address Translation (PAT) using the **single IP address** assigned to the external interface in Gamma_Router. Access-list number is 72. All the PCs should be able to ping the PC_Ext. (8 marks)

[Total: 25 marks]

ip static inside source list 72 interface s0/2/0 overload
access-list 72 10.4.4.0 0.0.0.255
access-list 72 10.1.1.0 0.0.0.255
access-list 72 10.5.5.0 0.0.0.255
access-list 72 10.3.3.0 0.0.0.255

int s0/1/0
ip nat inside
Int g0/0/1
ip nat inside
Int s0/2/0
ip nat outside

Question 4

a) One of the Wide Area Network (WAN) topologies is Dual-homed topology. With an aid of a diagram, illustrate the Dual-homed topology. (6 marks)

b) Differentiate Clientless Virtual Private Networks (VPN) connection with Client-based VPN connection. (6 marks)

c) (i) "Without Quality of Service (QoS), network devices will forward all packets during congestion". Do you agree with this statement? Appraise this statement. (5 marks)

(ii) Two mechanisms provided by Cisco IOS QoS software to prevent congestion are Traffic shaping and traffic policing. Differentiate these mechanisms. (8 marks)

[Total: 25 marks]

See back my tutorial answer.

May 2021

Question 1

a) With reference to Figure 1-1, answer the following:

```
Bangkok#show run
Building configuration...
---<output omitted>---
interface Serial0/2/0
ip address 209.165.200.189 255.255.255.224
clock rate 2000000
shutdown
!
interface Serial0/2/1
ip address 209.165.200.76 255.255.255.224
!
interface Vlan1
no ip address
shutdown
!
ip classless
ip route 0.0.0.0 0.0.0.0 Serial0/2/0
ip route 0.0.0.0 0.0.0.0 Serial0/2/1 60
!
```

Figure 1-1: Partial output of "show run"

(i) Identify and explain the type of static route shown in Figure 1-2.

```
S* 0.0.0.0/0 is directly connected, Serial0/2/0
```

Figure 1-2: Partial output of "show ip route" (3 marks)

(ii) Identify and explain the type of static route shown in Figure 1-3.

```
L 209.165.200.76/32 is directly connected, Serial0/2/1
```

Figure 1-3: Partial output of "show ip route" (3 marks)

(iii) Identify and explain the type of static route shown in Figure 1-4.

```
S* 0.0.0.0/0 is directly connected, Serial0/2/1
```

Figure 1-4: Partial output of "show ip route" (4 marks)

i. default static route - S* indicates it is a good candidate for default route, any packet not matching more specific route entries are forwarded out through exit interface s0/2/0

ii. local route - It uses a destination IP address of 209.165.200.76 and a 255.255.255.255 (/32) for IPv4 host route.

iii. default static route - S* indicates it is a good candidate for default route, any packet not matching more specific route entries are forwarded out through exit interface s0/2/1

(ii) Write a standard named access list to permit traffic from the upper half of the 212.77.7.0/24 network to reach 172.50.25.0/24 network; block the lower half of the addresses. But allow only host 212.77.7.2 to reach network 172.50.25.0/24. Permit all other traffic.
The name of the standard ACL is **Permit_Upper.** Use **keyword** in your ACE. Apply the Access Control Entries (ACE) to the router's interface. (5 marks)

(iii) Write an extended number access list by using **keyword** to permit HTTP traffic from 212.77.7.0 network to web Server0 172.50.25.99 but deny first 15 usable addresses HTTP traffic in 212.77.7.0 network intended for web Server0 172.50.25.99.
Permit HTTP traffic to any other web servers. Apply the Access Control Entries (ACE) to the router's interface. (8 marks)

(ii)
ip access-list standard Permit_Upper
permit 212.77.7.0 0.0.0.255
permit host 212.77.7.2
deny 212.77.7.0 0.0.0.255
permit any

RB
int g0/0/0
ip access-group Permit_Upper out

(iii)
access-list 101 deny tcp 212.77.7.0 0.0.0.15 host 172.50.25.99 eq 80
access-list 101 permit tcp 212.77.7.0 0.0.0.255 host 172.50.25.99 eq 80
access-list 101 permit tcp any any eq 80

RC
int g0/0/1
ip access-group 101 in

Question 4

a) "Without WANs, LANs would be a series of isolated networks. The only solution is to use private WAN infrastructures to interconnect the LANs. In addition, the Internet-based broadband connectivity is limited to wired options like DSL and fibre optic connection which cannot connect LANs together. "

Comment on this statement. (9 marks)

Are all of the modern wans considered private WANs?