EC4060 – COMPUTER AND DATA NETWORK

ASSIGNMENT 1 – INDEPENDENT LEARNING AND IMPLEMENTATION ASSIGNMENT

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1. Network Design Details

1.1 Subnetting Calculations

Department	Device Type	Total Devices	Future Growth (30%)	Required Hosts	Subnet Mask	Network Address	Usable IP Range	Broadcast Address
Computer Eng	Students	250	325	512	255.255.254.0 (/23)	192.168.0.0	192.168.0.1 - 192.168.1.254	192.168.1.255
	Staff	50	65	128	255.255.255.128 (/25)	192.168.2.0	192.168.2.1 - 192.168.2.126	192.168.2.127
	Other Devices	27	35	64	255.255.255.192 (/26)	192.168.2.128	192.168.2.129 - 192.168.2.190	192.168.2.191
EE Eng	Students	150	195	256	255.255.255.0 (/24)	192.168.3.0	192.168.3.1 - 192.168.3.254	192.168.3.255
	Staff	50	65	128	255.255.255.128 (/25)	192.168.4.0	192.168.4.1 - 192.168.4.126	192.168.4.127
	Other Devices	17	22	32	255.255.255.224 (/27)	192.168.4.128	192.168.4.129 - 192.168.4.158	192.168.4.159
Civil Eng	Students	75	98	128	255.255.255.128 (/25)	192.168.5.0	192.168.5.1 - 192.168.5.126	192.168.5.127
	Staff	25	33	64	255.255.255.192 (/26)	192.168.5.128	192.168.5.129 - 192.168.5.190	192.168.5.191
	Other Devices	7	10	16	255.255.255.240 (/28)	192.168.5.192	192.168.5.193 - 192.168.5.206	192.168.5.207
Mech Eng	Students	75	98	128	255.255.255.128 (/25)	192.168.6.0	192.168.6.1 - 192.168.6.126	192.168.6.127
	Staff	25	33	64	255.255.255.192 (/26)	192.168.6.128	192.168.6.129 - 192.168.6.190	192.168.6.191
	Other Devices	12	16	32	255.255.255.224 (/27)	192.168.6.192	192.168.6.193 - 192.168.6.222	192.168.6.223
IDS	Students	15	20	32	255.255.255.224 (/27)	192.168.7.0	192.168.7.1 - 192.168.7.30	192.168.7.31
	Staff	25	33	64	255.255.255.192 (/26)	192.168.7.32	192.168.7.33 - 192.168.7.94	192.168.7.95
	Other Devices	7	10	16	255.255.255.240 (/28)	192.168.7.96	192.168.7.97 - 192.168.7.110	192.168.7.111
Administration	Staff	25	33	64	255.255.255.192 (/26)	192.168.8.0	192.168.8.1 - 192.168.8.62	192.168.8.63
	Printers	5	7	16	255.255.255.240 (/28)	192.168.8.64	192.168.8.65 - 192.168.8.78	192.168.8.79
CCTV System	CCTV Cameras	50	65	128	255.255.255.128 (/25)	192.168.9.0	192.168.9.1 - 192.168.9.126	192.168.9.127

TABLE01: Subnet Table

1.2 VLAN Plan and Mapping

Department	VLAN ID	Device Type	Subnet	Subnet Mask	Network Address
Computer Eng	**10**	**Students**	192.168.0.0/23	255.255.254.0	192.168.0.0
	20	**Staff**	192.168.2.0/25	255.255.255.128	192.168.2.0
	30	**Other Devices**	192.168.2.128/26	255.255.255.192	192.168.2.128
EEE	**40**	**Students**	192.168.3.0/24	255.255.255.0	192.168.3.0
	50	**Staff**	192.168.4.0/25	255.255.255.128	192.168.4.0
	60	**Other Devices**	192.168.4.128/27	255.255.255.224	192.168.4.128
Civil Eng	**70**	**Students**	192.168.5.0/25	255.255.255.128	192.168.5.0
	80	**Staff**	192.168.5.128/26	255.255.255.192	192.168.5.128
	90	**Other Devices**	192.168.5.192/28	255.255.255.240	192.168.5.192
Mech Eng	**100**	**Students**	192.168.6.0/25	255.255.255.128	192.168.6.0

	110	**Staff**	192.168.6.128/26	255.255.255.192	192.168.6.128
	120	**Other Devices**	192.168.6.192/27	255.255.255.224	192.168.6.192
IDS	**130**	**Students**	192.168.7.0/27	255.255.255.224	192.168.7.0
	140	**Staff**	192.168.7.32/26	255.255.255.192	192.168.7.32
	150	**Other Devices**	192.168.7.96/28	255.255.255.240	192.168.7.96
Admin	**160**	**Staff**	192.168.8.0/26	255.255.255.192	192.168.8.0
	170	**Printers**	192.168.8.64/28	255.255.255.240	192.168.8.64
CCTV	**180**	**CCTV Cameras**	192.168.9.0/25	255.255.255.128	192.168.9.0

TABLE02: VLAN plan and Mapping

1.3 Topology diagram

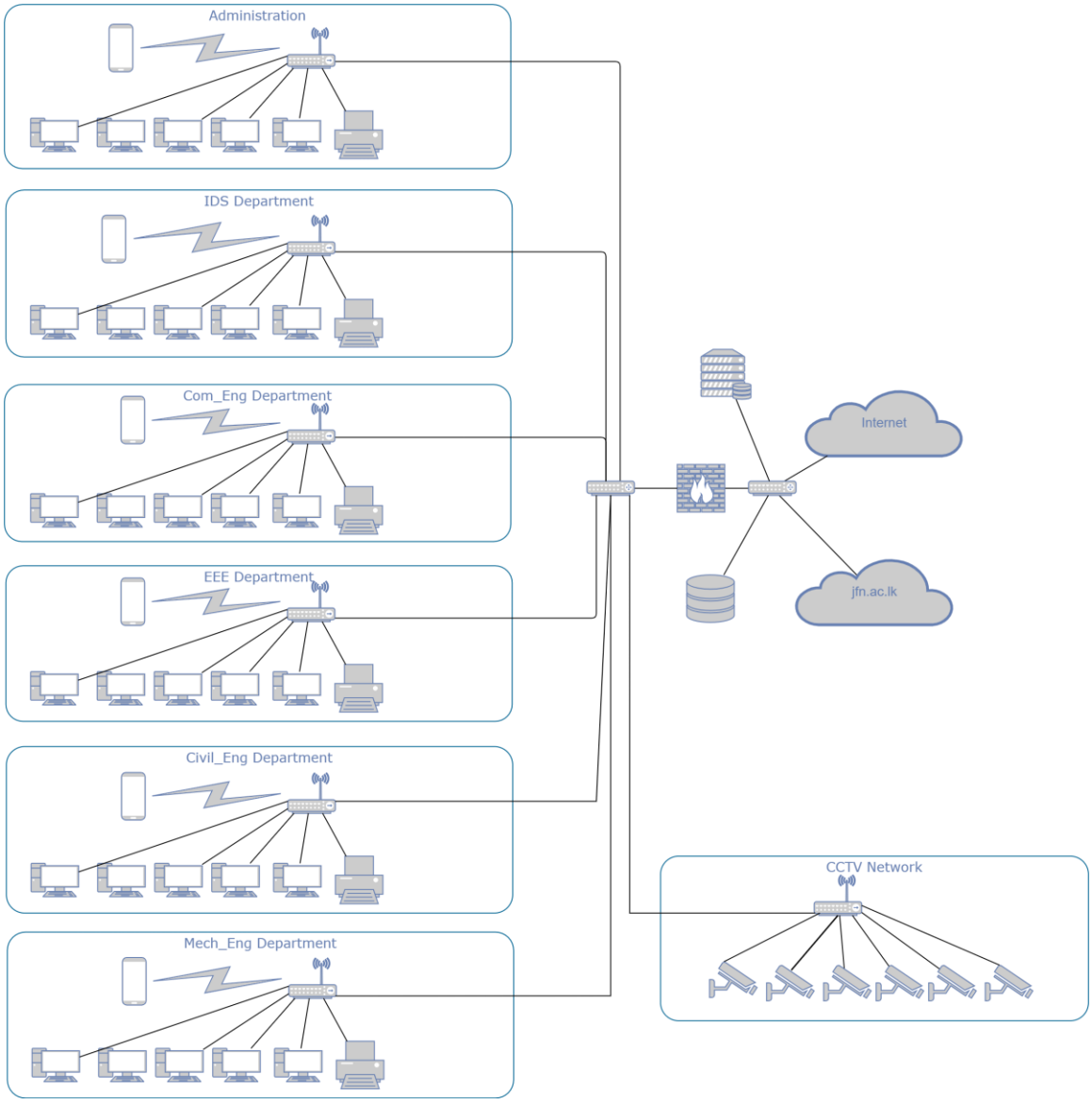

FIGURE01: Topology Diagram

2. Simulation Results

2.1 Device connectivity (ping and traceroute results)

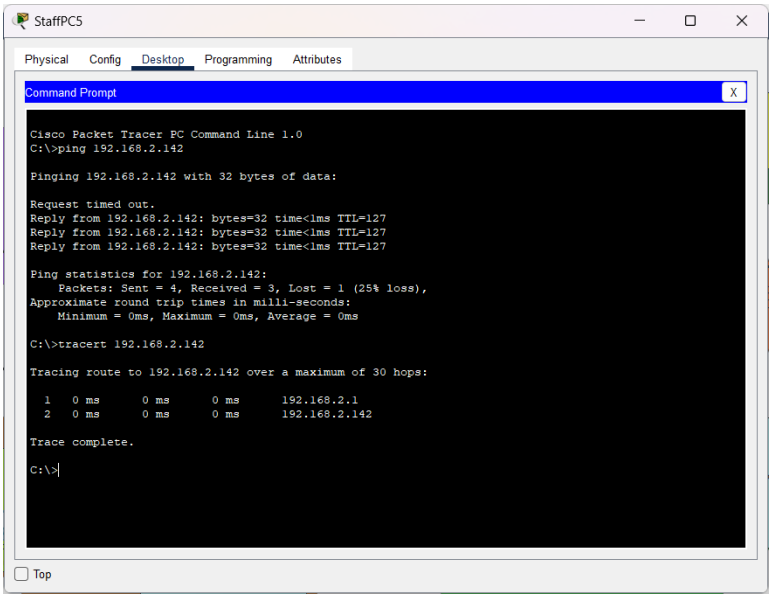

FIGURE02: Between staff devices and printers.

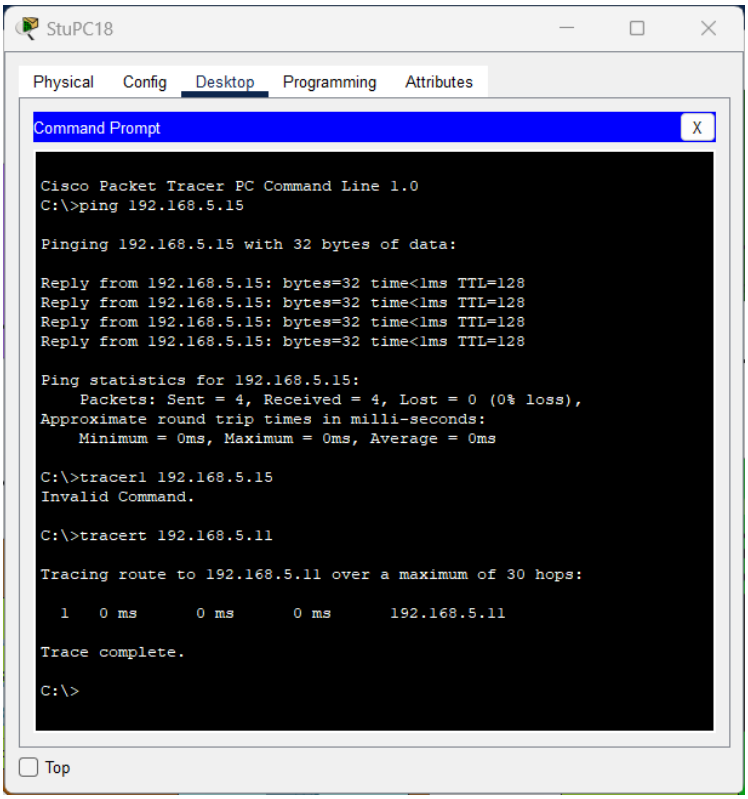

FIGURE03: Between student devices within the same subnet

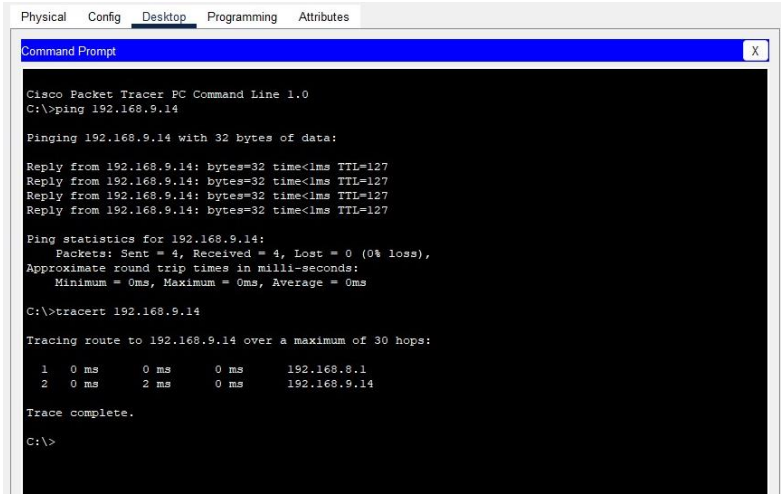

FIGURE04: Between CCTV cameras and the administration computers

2.2 VLAN and routing functionality tests

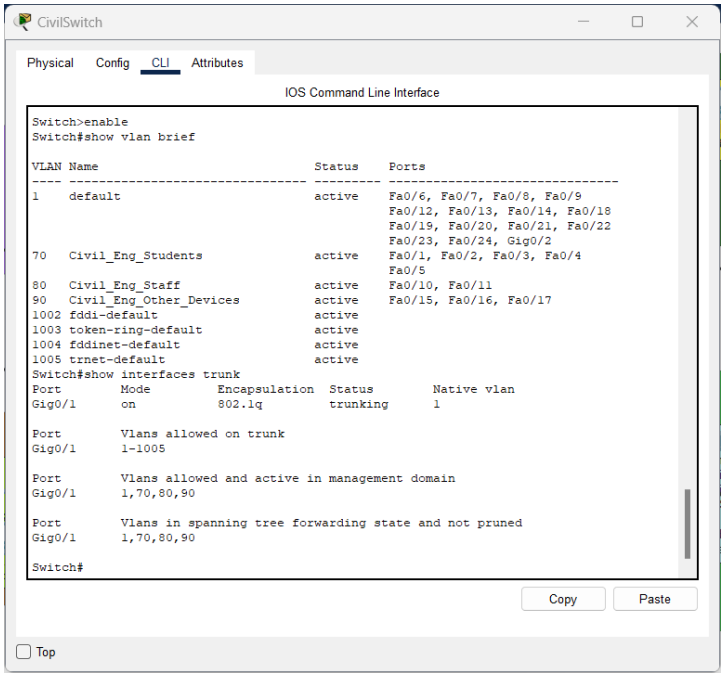

FIGURE05: VLAN and routing functionality tests using show vlan brief and show interfaces trunk commands.

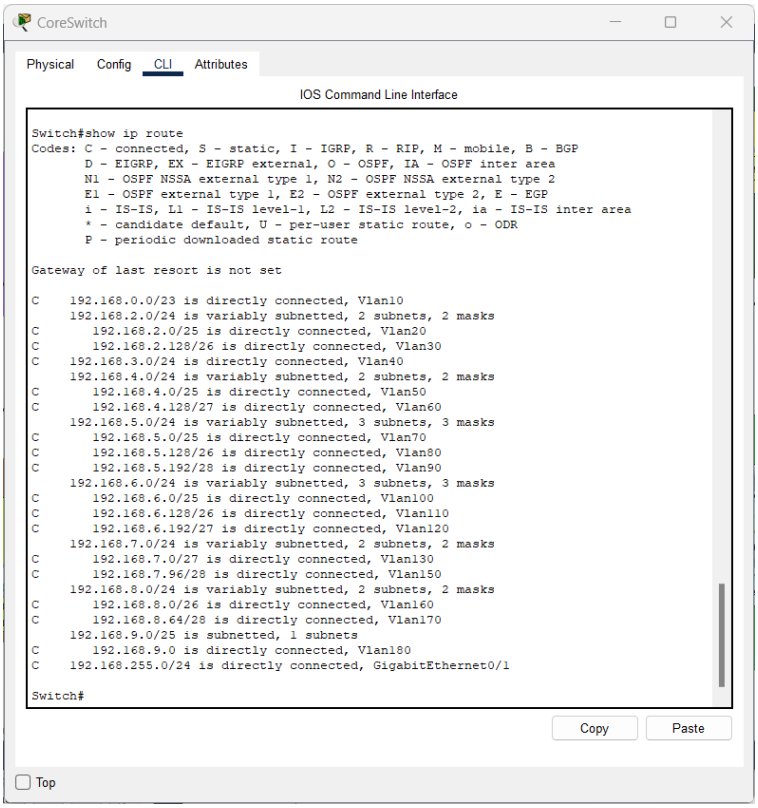

FIGURE06: VLAN and routing functionality tests using show ip route command

3. Scalability Validation

3.1 Future Growth Considerations

The network is designed with a **30% growth buffer** in mind, ensuring that the system can accommodate additional devices without requiring an immediate expansion of subnets or VLANs.

Calculation for Growth Buffer

For each department and device type, the initial device count is increased by 30%, and the next suitable subnet size is chosen. Below is an example calculation for Computer Engineering Students:

- **Initial Devices**: 250
- **Growth Factor (30%)**: 250 × 1.3 = **325 devices**
- **Required Hosts (including network & broadcast addresses)**: **325 + 2 = 327**
- **Smallest suitable subnet**: **/23 (512 hosts)**

The same method is used for all departments, ensuring that additional devices (students, staff, IoT, etc.) can be accommodated without modifying the subnet structure.

3.2 VLAN Trunking Implementation

VLAN Trunking allows multiple VLANs to traverse a single link between switches using IEEE 802.1Q encapsulation. This prevents the need for separate physical connections for each VLAN, making the network more scalable and flexible.

Example of VLAN Trunking in Our Network

Consider the Core L3 Switch connecting to department-wise L3 switches using a trunk link:

```
Core_L3_Switch(config)#interface GigabitEthernet0/1
Core_L3_Switch(config-if)#switchport mode trunk
Core_L3_Switch(config-if)#switchport trunk allowed vlan
10,20,30,40,50,60,70,80,90,100,110,120,130,140,150,160,170,180
```

Here:

- The trunk carries all VLAN traffic to and from the departments.
- Departments can expand VLANs without modifying the physical structure.

Example Scenario:
If a new research lab is added in the Computer Engineering department, a new VLAN (e.g., VLAN 190) can be created without additional cabling:

```
Core_L3_Switch(config)#vlan 190
Core_L3_Switch(config-vlan)#name ComEng_Research
Core_L3_Switch(config)#interface GigabitEthernet0/1
Core_L3_Switch(config-if)#switchport trunk allowed vlan add 190
```

This allows seamless expansion without altering core network configurations.

3.3 Quality of Service (QoS) Implementation

QoS ensures that critical network traffic (e.g., administrative data, VoIP calls, security camera feeds) gets higher priority than general user traffic.

Example: Prioritizing Security and Administrative Traffic

In our network, the CCTV VLAN (VLAN 180) and Admin VLANs (160 & 170) should be given higher priority to ensure uninterrupted service.

QoS can be implemented on the **Core L3 Switch**:

```
Core_L3_Switch(config)#class-map match-any CCTV_Traffic
Core_L3_Switch(config-cmap)#match ip dscp 46
Core_L3_Switch(config)#class-map match-any Admin_Traffic
Core_L3_Switch(config-cmap)#match ip dscp 34
Core_L3_Switch(config)#policy-map QoS_Policy
Core_L3_Switch(config-pmap)#class CCTV_Traffic
Core_L3_Switch(config-pmap-c)#priority percent 40
Core_L3_Switch(config-pmap)#class Admin_Traffic
Core_L3_Switch(config-pmap-c)#bandwidth percent 30
Core_L3_Switch(config)#interface GigabitEthernet0/1
Core_L3_Switch(config-if)#service-policy output QoS_Policy
```

4. Configuration Scripts

1. Core Router Configuration

```
enable
configure terminal
interface FastEthernet0/0
 ip address 192.168.255.1 255.255.255.0
 no shutdown
 exit
ip routing
ip route 192.168.0.0 255.255.254.0 192.168.255.2
ip route 192.168.2.0 255.255.255.0 192.168.255.2
ip route 192.168.3.0 255.255.255.0 192.168.255.2
ip route 192.168.4.0 255.255.255.0 192.168.255.2
ip route 192.168.5.0 255.255.255.0 192.168.255.2
ip route 192.168.6.0 255.255.255.0 192.168.255.2
ip route 192.168.7.0 255.255.255.0 192.168.255.2
ip route 192.168.8.0 255.255.255.0 192.168.255.2
ip route 192.168.9.0 255.255.255.128 192.168.255.2
copy running-config startup-config
exit
```

2. Core L3 Switch Configuration

```
enable
configure terminal

vlan 10
 name Computer_Eng_Students
vlan 20
 name Computer_Eng_Staff
vlan 30
 name Computer_Eng_Other_Devices
vlan 40
 name EEE_Students
vlan 50
 name EEE_Staff
vlan 60
 name EEE_Other_Devices
vlan 70
 name Civil_Eng_Students
vlan 80
 name Civil_Eng_Staff
vlan 90
```

```
 name Civil_Eng_Other_Devices
vlan 100
 name Mech_Eng_Students
vlan 110
 name Mech_Eng_Staff
vlan 120
 name Mech_Eng_Other_Devices
vlan 130
 name IDS_Students
vlan 140
 name IDS_Staff
vlan 150
 name IDS_Other_Devices
vlan 160
 name Admin_Staff
vlan 170
 name Admin_Printers
vlan 180
 name CCTV_Cameras
exit

interface GigabitEthernet0/1
 description Link to Core Router
 no switchport
 ip address 192.168.255.2 255.255.255.0
 no shutdown
 exit

interface FastEthernet0/1
 description Link to Computer Eng L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface FastEthernet0/2
 description Link to EE Eng L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface FastEthernet0/3
```

```
 description Link to Civil Eng L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface FastEthernet0/4
 description Link to Mech Eng L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface FastEthernet0/5
 description Link to IDS L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface FastEthernet0/6
 description Link to Admin L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface FastEthernet0/7
 description Link to CCTV L2 Switch
 switchport mode access
 switchport access vlan 180
 no shutdown
 exit

write memory
exit


interface Vlan10
 ip address 192.168.0.1 255.255.254.0
 exit

interface Vlan20
```

```
 ip address 192.168.2.1 255.255.255.128
 exit

interface Vlan30
 ip address 192.168.2.129 255.255.255.192
 exit

interface Vlan40
 ip address 192.168.3.1 255.255.255.0
 exit

interface Vlan50
 ip address 192.168.4.1 255.255.255.128
 exit

interface Vlan60
 ip address 192.168.4.129 255.255.255.224
 exit

interface Vlan70
 ip address 192.168.5.1 255.255.255.128
 exit

interface Vlan80
 ip address 192.168.5.129 255.255.255.192
 exit

interface Vlan90
 ip address 192.168.5.193 255.255.255.240
 exit

interface Vlan100
 ip address 192.168.6.1 255.255.255.128
 exit

interface Vlan110
 ip address 192.168.6.129 255.255.255.192
 exit

interface Vlan120
 ip address 192.168.6.193 255.255.255.224
 exit
```

```
interface Vlan130
 ip address 192.168.7.1 255.255.255.224
 exit

interface Vlan140
 ip address 192.168.7.33 255.255.255.192
 exit

interface Vlan150
 ip address 192.168.7.97 255.255.255.240
 exit

interface Vlan160
 ip address 192.168.8.1 255.255.255.192
 exit

interface Vlan170
 ip address 192.168.8.65 255.255.255.240
 exit

interface Vlan180
 ip address 192.168.9.1 255.255.255.128
 exit

ip routing
ip default-gateway 192.168.255.1

write memory
exit
```

3. Department L3 Switch Configuration

Commands for Computer Engineering L3 Switch:

```
enable
configure terminal

vlan 10
 name Com_Eng_Students
vlan 20
 name Com_Eng_Staff
vlan 30
 name Com_Eng_Other_Devices
exit
```

```
interface GigabitEthernet0/1
 description Link to Core L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface GigabitEthernet0/2
 description Link to Com Eng L2 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface Vlan10
 description Com Eng Students
 ip address 192.168.0.1 255.255.254.0
 no shutdown
 exit

interface Vlan20
 description Com Eng Staff
 ip address 192.168.2.1 255.255.255.128
 no shutdown
 exit

interface Vlan30
 description Com Eng Other Devices
 ip address 192.168.2.129 255.255.255.192
 no shutdown
 exit

ip routing
ip default-gateway 192.168.255.2

write memory
exit
```

EEE L3 Switch Configuration

```
enable
configure terminal

vlan 40
```

```
 name EEE_Students
vlan 50
 name EEE_Staff
vlan 60
 name EEE_Other_Devices
exit

interface GigabitEthernet0/1
 description Link to Core L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface GigabitEthernet0/2
 description Link to EEE L2 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface Vlan40
 description EEE Students
 ip address 192.168.3.1 255.255.255.0
 no shutdown
 exit

interface Vlan50
 description EEE Staff
 ip address 192.168.4.1 255.255.255.128
 no shutdown
 exit

interface Vlan60
 description EEE Other Devices
 ip address 192.168.4.129 255.255.255.224
 no shutdown
 exit

ip routing
ip default-gateway 192.168.255.2

write memory
```

exit

Civil Eng L3 Switch Configuration

```
enable
configure terminal
vlan 70
 name Civil_Eng_Students
vlan 80
 name Civil_Eng_Staff
vlan 90
 name Civil_Eng_Other_Devices
exit

interface GigabitEthernet0/1
 description Link to Core L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit
interface GigabitEthernet0/2
 description Link to Civil Eng L2 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit
interface Vlan70
 description Civil Eng Students
 ip address 192.168.5.1 255.255.255.128
 no shutdown
 exit
interface Vlan80
 description Civil Eng Staff
 ip address 192.168.5.129 255.255.255.192
 no shutdown
 exit
interface Vlan90
 description Civil Eng Other Devices
 ip address 192.168.5.193 255.255.255.240
 no shutdown
 exit

ip routing
ip default-gateway 192.168.255.2
```

```
write memory
exit
```

Mech Eng L3 Switch Configuration

```
enable
configure terminal
vlan 100
 name Mech_Eng_Students
vlan 110
 name Mech_Eng_Staff
vlan 120
 name Mech_Eng_Other_Devices
exit

interface GigabitEthernet0/1
 description Link to Core L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit
interface GigabitEthernet0/2
 description Link to Mech Eng L2 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface Vlan100
 description Mech Eng Students
 ip address 192.168.6.1 255.255.255.128
 no shutdown
 exit
interface Vlan110
 description Mech Eng Staff
 ip address 192.168.6.129 255.255.255.192
 no shutdown
 exit
interface Vlan120
 description Mech Eng Other Devices
 ip address 192.168.6.193 255.255.255.224
 no shutdown
```

```
 exit

ip routing
ip default-gateway 192.168.255.2

write memory
exit
```

IDS L3 Switch Configuration

```
enable
configure terminal
vlan 130
 name IDS_Students
vlan 140
 name IDS_Staff
vlan 150
 name IDS_Other_Devices
exit

interface GigabitEthernet0/1
 description Link to Core L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit
interface GigabitEthernet0/2
 description Link to IDS L2 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface Vlan130
 description IDS Students
 ip address 192.168.7.1 255.255.255.224
 no shutdown
 exit
interface Vlan140
 description IDS Staff
 ip address 192.168.7.33 255.255.255.192
 no shutdown
 exit
interface Vlan150
```

```
 description IDS Other Devices
 ip address 192.168.7.97 255.255.255.240
 no shutdown
 exit

ip routing
ip default-gateway 192.168.255.2

write memory
exit
```

Admin L3 Switch Configuration

```
enable
configure terminal
vlan 160
 name Admin_Staff
vlan 170
 name Admin_Printers
exit

interface GigabitEthernet0/1
 description Link to Core L3 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit
interface GigabitEthernet0/2
 description Link to Admin L2 Switch
 switchport trunk encapsulation dot1q
 switchport mode trunk
 no shutdown
 exit

interface Vlan160
 description Admin Staff
 ip address 192.168.8.1 255.255.255.192
 no shutdown
 exit
interface Vlan170
 description Admin Printers
 ip address 192.168.8.65 255.255.255.240
```

```
 no shutdown
 exit

ip routing
ip default-gateway 192.168.255.2

write memory
exit
```

Com Eng L2 Switch Configuration

```
enable
configure terminal
vlan 10
 name Com_Eng_Students
vlan 20
 name Com_Eng_Staff
vlan 30
 name Com_Eng_Other_Devices
exit

interface GigabitEthernet0/1
 description Link to Com Eng L3 Switch
switchport mode trunk
 no shutdown
 exit

interface range FastEthernet0/1 - 5
 description Com Eng Student PCs
 switchport mode access
 switchport access vlan 10
 no shutdown
 exit
interface range FastEthernet0/10 - 11
 description Com Eng Staff PCs
 switchport mode access
 switchport access vlan 20
 no shutdown
 exit
interface FastEthernet0/15
 description Com Eng Printer
 switchport mode access
 switchport access vlan 30
 no shutdown
```

```
 exit
interface range FastEthernet0/16 - 17
 description Com Eng Other Devices
 switchport mode access
 switchport access vlan 30
 no shutdown
 exit

exit
write memory
```

EEE L2 Switch Configuration

```
enable
configure terminal
vlan 40
 name EEE_Students
vlan 50
 name EEE_Staff
vlan 60
 name EEE_Other_Devices
exit

interface GigabitEthernet0/1
 description Link to EEE L3 Switch
 switchport mode trunk
 no shutdown
 exit

interface range FastEthernet0/1 - 5
 description EEE Student PCs
 switchport mode access
 switchport access vlan 40
 no shutdown
 exit
interface range FastEthernet0/10 - 11
 description EEE Staff PCs
 switchport mode access
 switchport access vlan 50
```

```
 no shutdown
 exit
interface FastEthernet0/15
 description EEE Printer
 switchport mode access
 switchport access vlan 60
 no shutdown
 exit
interface range FastEthernet0/16 - 17
 description EEE Other Devices
 switchport mode access
 switchport access vlan 60
 no shutdown
 exit
exit
write memory
```

Civil Eng L2 Switch Configuration

```
enable
configure terminal
vlan 70
 name Civil_Eng_Students
vlan 80
 name Civil_Eng_Staff
vlan 90
 name Civil_Eng_Other_Devices
exit

interface GigabitEthernet0/1
 description Link to Civil Eng L3 Switch
 switchport mode trunk
 no shutdown
 exit

interface range FastEthernet0/1 - 5
 description Civil Eng Student PCs
 switchport mode access
 switchport access vlan 70
 no shutdown
```

```
 exit
interface range FastEthernet0/10 - 11
 description Civil Eng Staff PCs
 switchport mode access
 switchport access vlan 80
 no shutdown
 exit
interface FastEthernet0/15
 description Civil Eng Printer
 switchport mode access
 switchport access vlan 90
 no shutdown
 exit
interface range FastEthernet0/16 - 17
 description Civil Eng Other Devices
 switchport mode access
 switchport access vlan 90
 no shutdown
 exit

exit
write memory
```

Mech Eng L2 Switch Configuration

Step 1: Create VLANs

```
enable
configure terminal
vlan 100
 name Mech_Eng_Students
vlan 110
 name Mech_Eng_Staff
vlan 120
 name Mech_Eng_Other_Devices
exit
```

Step 2: Configure Trunk Port to Mech Eng L3 Switch

```
interface GigabitEthernet0/1
 description Link to Mech Eng L3 Switch
 switchport mode trunk
 no shutdown
 exit
```

Step 3: Assign Access Ports to VLANs

```
interface range FastEthernet0/1 - 5
 description Mech Eng Student PCs
 switchport mode access
 switchport access vlan 100
 no shutdown
 exit
interface range FastEthernet0/10 - 11
 description Mech Eng Staff PCs
 switchport mode access
 switchport access vlan 110
 no shutdown
 exit
interface FastEthernet0/15
 description Mech Eng Printer
 switchport mode access
 switchport access vlan 120
 no shutdown
 exit
interface range FastEthernet0/16 - 17
 description Mech Eng Other Devices
 switchport mode access
 switchport access vlan 120
 no shutdown
 exit
```

Step 4: Save Configuration

```
exit
write memory
```

IDS L2 Switch Configuration

```
enable
configure terminal
vlan 130
 name IDS_Students
vlan 140
 name IDS_Staff
vlan 150
 name IDS_Other_Devices
exit
interface GigabitEthernet0/1
 description Link to IDS L3 Switch
```

```
 switchport mode trunk
 no shutdown
 exit
interface range FastEthernet0/1 - 3
 description IDS Student PCs
 switchport mode access
 switchport access vlan 130
 no shutdown
 exit
interface range FastEthernet0/10 - 11
 description IDS Staff PCs
 switchport mode access
 switchport access vlan 140
 no shutdown
 exit
interface FastEthernet0/15
 description IDS Printer
 switchport mode access
 switchport access vlan 150
 no shutdown
 exit
interface range FastEthernet0/16 - 17
 description IDS Other Devices
 switchport mode access
 switchport access vlan 150
 no shutdown
 exit
exit
write memory
```

Admin L2 Switch Configuration

```
enable
configure terminal
vlan 160
 name Admin_Staff
vlan 170
 name Admin_Printers
exit
interface GigabitEthernet0/1
 description Link to Admin L3 Switch
 switchport mode trunk
 no shutdown
 exit
```

```
interface range FastEthernet0/1 - 2
 description Admin Staff PCs
 switchport mode access
 switchport access vlan 160
 no shutdown
 exit
interface FastEthernet0/10
 description Admin Printer
 switchport mode access
 switchport access vlan 170
 no shutdown
 exit
exit
write memory
```

CCTV L2 Switch Configuration

Step 1: Create VLAN for CCTV Cameras

```
enable
configure terminal
vlan 180
 name CCTV_Cameras
exit
interface GigabitEthernet0/1
 description Link to Core L3 Switch
 switchport mode trunk
 no shutdown
 exit
interface range FastEthernet0/1 - 4
 description CCTV Cameras
 switchport mode access
 switchport access vlan 180
 no shutdown
 exit
exit
write memory
```

Configure DHCP

1. Configure DHCP on the Core L3 Switch

```
enable
```

```
configure terminal
service dhcp
ip dhcp pool Com_Eng_Students
 network 192.168.0.0 255.255.254.0
 default-router 192.168.0.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Com_Eng_Staff
 network 192.168.2.0 255.255.255.128
 default-router 192.168.2.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Com_Eng_Other_Devices
 network 192.168.2.128 255.255.255.192
 default-router 192.168.2.129
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool EEE_Students
 network 192.168.3.0 255.255.255.0
 default-router 192.168.3.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool EEE_Staff
 network 192.168.4.0 255.255.255.128
 default-router 192.168.4.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool EEE_Other_Devices
 network 192.168.4.128 255.255.255.224
 default-router 192.168.4.129
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Civil_Eng_Students
 network 192.168.5.0 255.255.255.128
 default-router 192.168.5.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
```

```
 exit
ip dhcp pool Civil_Eng_Staff
 network 192.168.5.128 255.255.255.192
 default-router 192.168.5.129
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Civil_Eng_Other_Devices
 network 192.168.5.192 255.255.255.240
 default-router 192.168.5.193
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Mech_Eng_Students
 network 192.168.6.0 255.255.255.128
 default-router 192.168.6.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Mech_Eng_Staff
 network 192.168.6.128 255.255.255.192
 default-router 192.168.6.129
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Mech_Eng_Other_Devices
 network 192.168.6.192 255.255.255.224
 default-router 192.168.6.193
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool IDS_Students
 network 192.168.7.0 255.255.255.224
 default-router 192.168.7.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool IDS_Staff
 network 192.168.7.32 255.255.255.192
 default-router 192.168.7.33
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
```

```
ip dhcp pool IDS_Other_Devices
 network 192.168.7.96 255.255.255.240
 default-router 192.168.7.97
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Admin_Staff
 network 192.168.8.0 255.255.255.192
 default-router 192.168.8.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Admin_Printers
 network 192.168.8.64 255.255.255.240
 default-router 192.168.8.65
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool CCTV_Cameras
 network 192.168.9.0 255.255.255.128
 default-router 192.168.9.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp excluded-address 192.168.0.1 192.168.0.10
ip dhcp excluded-address 192.168.2.1 192.168.2.10
ip dhcp excluded-address 192.168.2.129 192.168.2.138
ip dhcp excluded-address 192.168.3.1 192.168.3.10
ip dhcp excluded-address 192.168.4.1 192.168.4.10
ip dhcp excluded-address 192.168.4.129 192.168.4.138
ip dhcp excluded-address 192.168.5.1 192.168.5.10
ip dhcp excluded-address 192.168.5.129 192.168.5.138
ip dhcp excluded-address 192.168.5.193 192.168.5.202
ip dhcp excluded-address 192.168.6.1 192.168.6.10
ip dhcp excluded-address 192.168.6.129 192.168.6.138
ip dhcp excluded-address 192.168.6.193 192.168.6.202
ip dhcp excluded-address 192.168.7.1 192.168.7.10
ip dhcp excluded-address 192.168.7.33 192.168.7.42
ip dhcp excluded-address 192.168.7.97 192.168.7.106
ip dhcp excluded-address 192.168.8.1 192.168.8.10
ip dhcp excluded-address 192.168.8.65 192.168.8.74
ip dhcp excluded-address 192.168.9.1 192.168.9.10
exit
```

write memory

DHCP Configuration for Com Eng L3 Switch

```
enable
configure terminal
service dhcp

ip dhcp pool Com_Eng_Students
 network 192.168.0.0 255.255.254.0
 default-router 192.168.0.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Com_Eng_Staff
 network 192.168.2.0 255.255.255.128
 default-router 192.168.2.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Com_Eng_Other_Devices
 network 192.168.2.128 255.255.255.192
 default-router 192.168.2.129
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit

ip dhcp excluded-address 192.168.0.1 192.168.0.10
ip dhcp excluded-address 192.168.2.1 192.168.2.10
ip dhcp excluded-address 192.168.2.129 192.168.2.138


interface Vlan10
 ip helper-address 192.168.255.2
 exit

interface Vlan20
 ip helper-address 192.168.255.2
 exit

interface Vlan30
 ip helper-address 192.168.255.2
 exit
```

exit
write memory

DHCP configuration commands for the **EEE L3 Switch**:

enable
configure terminal
service dhcp

ip dhcp pool EEE_Students
network 192.168.3.0 255.255.255.0
default-router 192.168.3.1
dns-server 8.8.8.8
dns-server 8.8.4.4
exit
ip dhcp pool EEE_Staff
network 192.168.4.0 255.255.255.128
default-router 192.168.4.1
dns-server 8.8.8.8
dns-server 8.8.4.4
exit
ip dhcp pool EEE_Other_Devices
network 192.168.4.128 255.255.255.224
default-router 192.168.4.129
dns-server 8.8.8.8
dns-server 8.8.4.4
exit

ip dhcp excluded-address 192.168.3.1 192.168.3.10
ip dhcp excluded-address 192.168.4.1 192.168.4.10
ip dhcp excluded-address 192.168.4.129 192.168.4.138

exit
write memory

enable
configure terminal
interface Vlan40
ip helper-address 192.168.255.2

```
exit

interface Vlan50
ip helper-address 192.168.255.2
exit

interface Vlan60
ip helper-address 192.168.255.2
exit
write memory
```

DHCP configuration commands for the **Civil Eng L3 Switch**:

```
enable
configure terminal
service dhcp

ip dhcp pool Civil_Eng_Students
 network 192.168.5.0 255.255.255.128
 default-router 192.168.5.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Civil_Eng_Staff
 network 192.168.5.128 255.255.255.192
 default-router 192.168.5.129
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Civil_Eng_Other_Devices
 network 192.168.5.192 255.255.255.240
 default-router 192.168.5.193
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit

ip dhcp excluded-address 192.168.5.1 192.168.5.10
ip dhcp excluded-address 192.168.5.129 192.168.5.138
ip dhcp excluded-address 192.168.5.193 192.168.5.202

interface Vlan70
 ip helper-address 192.168.255.2
```

```
 exit

interface Vlan80
 ip helper-address 192.168.255.2
 exit

interface Vlan90
 ip helper-address 192.168.255.2
 exit
exit
write memory
```

DHCP configuration commands for the **Mech Eng L3 Switch**:

```
enable
configure terminal
service dhcp

ip dhcp pool Mech_Eng_Students
 network 192.168.6.0 255.255.255.128
 default-router 192.168.6.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Mech_Eng_Staff
 network 192.168.6.128 255.255.255.192
 default-router 192.168.6.129
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Mech_Eng_Other_Devices
 network 192.168.6.192 255.255.255.224
 default-router 192.168.6.193
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit

ip dhcp excluded-address 192.168.6.1 192.168.6.10
ip dhcp excluded-address 192.168.6.129 192.168.6.138
ip dhcp excluded-address 192.168.6.193 192.168.6.202

interface Vlan100
```

```
 ip helper-address 192.168.255.2
 exit

interface Vlan110
 ip helper-address 192.168.255.2
 exit

interface Vlan120
 ip helper-address 192.168.255.2
 exit
exit
write memory
```

DHCP configuration commands for the **IDS L3 Switch**:

```
enable
configure terminal
service dhcp

ip dhcp pool IDS_Students
 network 192.168.7.0 255.255.255.224
 default-router 192.168.7.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool IDS_Staff
 network 192.168.7.32 255.255.255.192
 default-router 192.168.7.33
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool IDS_Other_Devices
 network 192.168.7.96 255.255.255.240
 default-router 192.168.7.97
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit

ip dhcp excluded-address 192.168.7.1 192.168.7.10
ip dhcp excluded-address 192.168.7.33 192.168.7.42
ip dhcp excluded-address 192.168.7.97 192.168.7.106

interface Vlan130
```

```
 ip helper-address 192.168.255.2
 exit

interface Vlan140
 ip helper-address 192.168.255.2
 exit

interface Vlan150
 ip helper-address 192.168.255.2
 exit
exit
write memory
```

DHCP configuration commands for the **Admin L3 Switch**:

```
enable
configure terminal
service dhcp

ip dhcp pool Admin_Staff
 network 192.168.8.0 255.255.255.192
 default-router 192.168.8.1
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit
ip dhcp pool Admin_Printers
 network 192.168.8.64 255.255.255.240
 default-router 192.168.8.65
 dns-server 8.8.8.8
 dns-server 8.8.4.4
 exit

ip dhcp excluded-address 192.168.8.1 192.168.8.10
ip dhcp excluded-address 192.168.8.65 192.168.8.74

interface Vlan160
 ip helper-address 192.168.255.2
 exit

interface Vlan170
 ip helper-address 192.168.255.2
 exit
exit
```

write memory

Commands to Block Students from Accessing Printers and Other Devices

Commands for Com Eng L3 Switch

```
enable
configure terminal
ip access-list extended BLOCK_STUDENTS
 deny ip 192.168.0.0 0.0.1.255 192.168.2.128 0.0.0.63
 permit ip any any
 exit
interface Vlan10
 ip access-group BLOCK_STUDENTS in
 exit
exit
write memory
```

Commands for EEE L3 Switch

```
enable
configure terminal
ip access-list extended BLOCK_STUDENTS
 deny ip 192.168.3.0 0.0.0.255 192.168.4.128 0.0.0.31
 permit ip any any
 exit
interface Vlan40
 ip access-group BLOCK_STUDENTS in
 exit
exit
write memory
```

Commands for Civil Eng L3 Switch

```
enable
configure terminal
ip access-list extended BLOCK_STUDENTS
 deny ip 192.168.5.0 0.0.0.127 192.168.5.192 0.0.0.15
 permit ip any any
 exit
interface Vlan70
 ip access-group BLOCK_STUDENTS in
 exit
exit
write memory
```

Commands for Mech Eng L3 Switch

```
enable
configure terminal
ip access-list extended BLOCK_STUDENTS
 deny ip 192.168.6.0 0.0.0.127 192.168.6.192 0.0.0.31
 permit ip any any
 exit
interface Vlan100
 ip access-group BLOCK_STUDENTS in
 exit
exit
write memory
```

Commands for IDS L3 Switch

```
enable
configure terminal
ip access-list extended BLOCK_STUDENTS
 deny ip 192.168.7.0 0.0.0.31 192.168.7.96 0.0.0.15
 permit ip any any
 exit
interface Vlan130
 ip access-group BLOCK_STUDENTS in
 exit
exit
write memory
```