UNIVERSITI SAINS MALAYSIA

First Semester Examination
2014/2015 Academic Session

December 2014/January 2015

CST332 – Internet Protocols, Architecture & Routing
[Protokol, Seni Bina & Penghalaan Internet]

Duration : 2 hours
[Masa : 2 jam]

INSTRUCTIONS TO CANDIDATE:
[ARAHAN KEPADA CALON:]

• Please ensure that this examination paper contains **FOUR** questions in **TEN** printed pages before you begin the examination.

  *[Sila pastikan bahawa kertas peperiksaan ini mengandungi **EMPAT** soalan di dalam **SEPULUH** muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]*

• Answer **ALL** questions.

  *[Jawab **SEMUA** soalan.]*

• You may answer the questions either in English or in Bahasa Malaysia.

  [Anda dibenarkan menjawab soalan sama ada dalam bahasa Inggeris atau bahasa Malaysia.]

• In the event of any discrepancies, the English version shall be used.

  [Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi bahasa Inggeris hendaklah diguna pakai.]

1.　(a)　(i)　State **two (2)** differences between switch and router.

　　　　(ii)　Give **two (2)** advantages of VLAN in terms of security and network performance.

(8/100)

　　(b)　(i)　What are the differences between routing and routed protocol? Give **two (2)** examples each for routing and routed protocols.

　　　　(ii)　Describe the advantages of static routing protocols and dynamic routing protocols

(8/100)

　　(c)　What is route summarization? Describe the advantages of route summarization.

(4/100)

2.　Given the network topology diagram as shown below for a new USM campus.
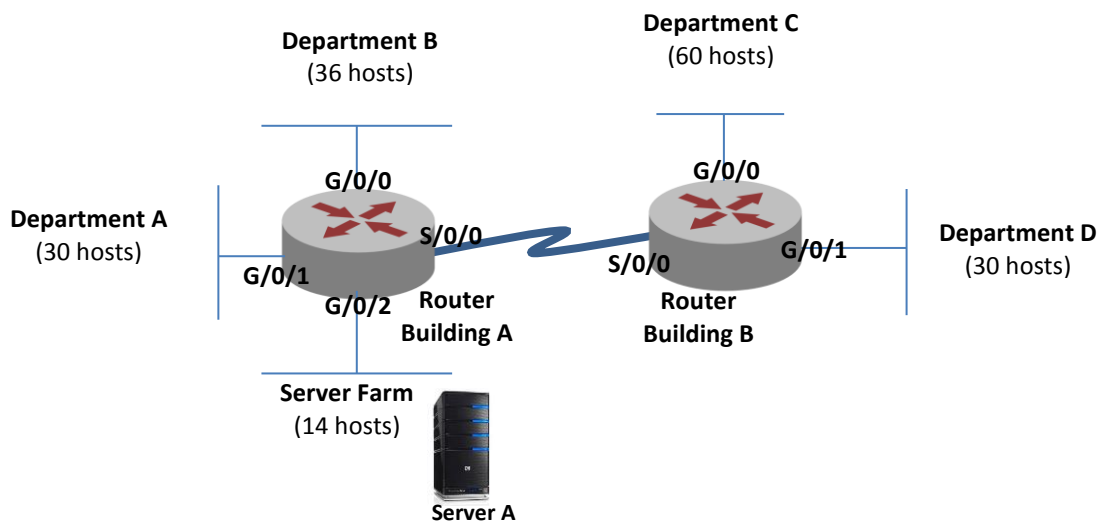
The ISP has allocated the IP subnet 192.162.10.0/24 to the new USM campus for its use. Due to limited number of IP addresses allocated, and for network security reasons, you are required to devise a Variable Length Subnet Mask (VLSM) subnetting scheme that would be able to accommodate the requirements in the network topology shown in the diagram above

Note:You don't have to consider the link between Router at Building A and Router at Building B in your subnetting requirements – assume that it has already been assigned suitable subnet addresses.

(a) (i) How many host addresses are available in the /24 network?

(ii) What is the total number of host addresses needed in the network topology shown in the diagram above?

(iii) How many subnets are needed in the network topology given?

(6/100)

(b) Fill in the details of the network subnets in the table below:

Location	Interface	Interface IP Address	Allocated IP addresses	NetMask (/XX)	Assignable Range of IP addresses
Building A	G/0/0				
	G/0/1				
	G/0/2				
Building B	G/0/0				
	G/0/1				

(20/100)

(c) Give the correct IP address, Netmask and default router for the network configuration at server A.

(4/100)

3. (a) Briefly describe the **three** (**3**) main components of dynamic routing protocols and the fundamentals of its operation.

(10/100)

(b) Explain the link-state operation of Open Shortest Path First (OSPF) routers to reach a state of convergence.

(8/100)

(c) The diagram below shows the structure of an Enterprise Architecture. Choose the routing protocol that is suitable for use in the Campus Core. Justify your answer.
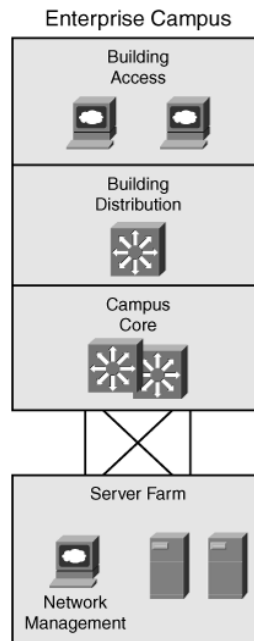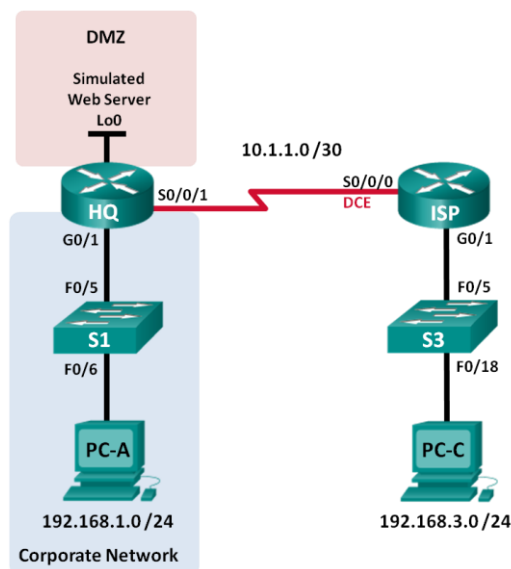

(7/100)

4. (a) Explain in detail how a network engineer can use a router to protect networks from unauthorized use. Give example(s) on the tasks that can be performed in your explanation.

(6/100)

(b) A small company has just added a web server to the network to allow customers to access confidential information as shown in the diagram below.

Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
HQ	G0/1	192.168.1.1	255.255.255.0	N/A
	S0/0/1	10.1.1.2	255.255.255.252	N/A
	Lo0	192.168.4.1	255.255.255.0	N/A
ISP	G0/1	192.168.3.1	255.255.255.0	N/A
	S0/0/0 (DCE)	10.1.1.1	255.255.255.252	N/A
S1	VLAN 1	192.168.1.11	255.255.255.0	192.168.1.1
S3	VLAN 1	192.168.3.11	255.255.255.0	192.168.3.1
PC-A	NIC	192.168.1.3	255.255.255.0	192.168.1.1
PC-C	NIC	192.168.3.3	255.255.255.0	192.168.3.1

The company network is divided into two zones: Corporate network zone and Demilitarized Zone (DMZ) as shown in the diagram. The corporate network zone houses private servers and internal clients. The DMZ houses the externally accessible web server (simulated by Lo0 on HQ). Design Access Control Lists (ACLs) based on the following conditions:

- ACL 101 is implemented to limit the traffic out of the corporate network zone. This zone houses the private servers and internal clients (192.168.1.0/24). No other network should be able to access it.

- ACL 102 is used to limit the traffic into the corporate network. Only responses to requests that originated from within the corporate network are allowed back into that network. This includes TCP-based requests from internal hosts such as Web and FTP. ICMP is allowed into the network for troubleshooting purposes so that incoming ICMP messages generated in response to pings can be received by internal hosts

- ACL 121 controls outside traffic to the DMZ and corporate network. Only HTTP traffic is allowed to the DMZ web server (simulated by Lo0 on R1). Other network related traffic, such as EIGRP, is allowed from outside networks. Furthermore, valid internal private addresses, such as 192.168.1.0, loopback address such as 127.0.0.0 and multicast addresses are denied entrance to the corporate network to prevent malicious network attacks from outside users.

Note: All ACLs must be applied to the HQ router because the company can only administer its own HQ router.

(13/100)

(c) What is the purpose of Dynamic Host Configuration Protocol (DHCP)? Give **two** (**2**) reasons why DHCP-based network configuration is preferable to static (manual) configuration.
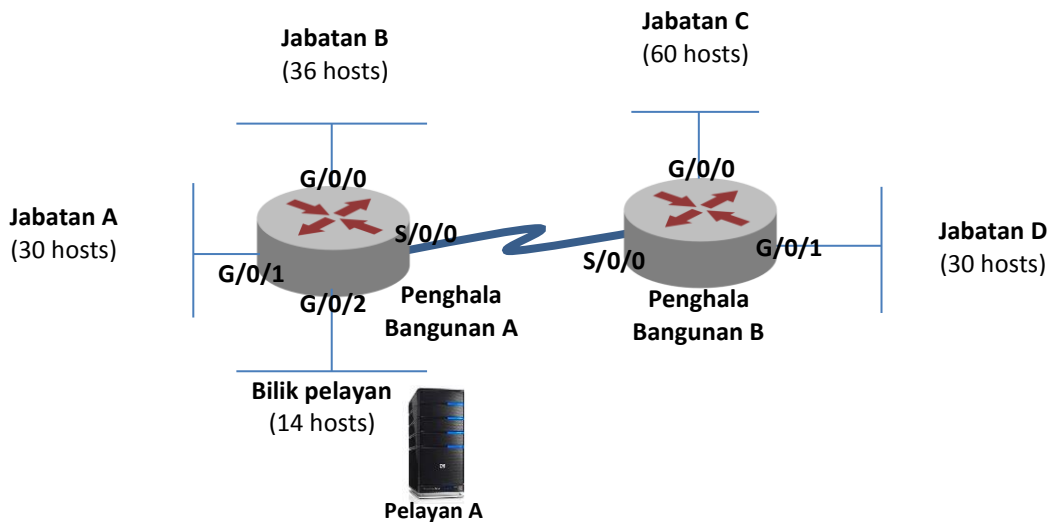
(6/100)

1. (a) (i) Nyatakan **dua** (**2**) perbezaan antara suis dan penghala.

   (ii) Beri **dua** (**2**) kebaikan VLAN dalam perkara keselamatan dan prestasi rangkaian

   (8/100)

   (b) (i) Apakah perbezaan antara protokol penghalaan dan protokol terhala? Beri **dua** (**2**) contoh setiap satu bagi protokol penghalaan dan protokol terhala.

   (ii) Huraikan kebaikan protokol-protokol penghalaan statik dan protokol-protokol penghalaan dinamik.

   (8/100)

   (c) Apakah ringkasan halaan? Huraikan kebaikan-kebaikan ringkasan halaan.

   (4/100)

2. Diberi gambar rajah topologi rangkaian seperti di bawah untuk kampus baru USM.

Jabatan B
(36 hosts)

Jabatan C
(60 hosts)

G/0/0

G/0/0

Jabatan A
(30 hosts)

S/0/0

Jabatan D
(30 hosts)

G/0/1

G/0/1

S/0/0

G/0/2

Penghala Bangunan A

Penghala Bangunan B

Bilik pelayan
(14 hosts)

Pelayan A

ISP telah memperuntukkan subnet IP 192.162.10.0/24 kepada kampus baru USM untuk kegunaannya. Disebabkan bilangan alamat IP yang terhad dan atas sebab-sebab keselamatan rangkaian, anda dikehendaki merancang skema subnet topeng panjang boleh ubah (VLSM) yang dapat menampung keperluan-keperluan seperti ditunjukkan dalam gambar rajah topologi rangkaian di atas.

Nota: Anda tidak perlu mengambil kira sambungan antara penghala pada bangunan A dan penghala pada bangunan B dalam keperluan subnet anda.– andaikan sambungan penghala tersebut telah diperuntukkan dengan alamat-alamat subnet yang sesuai.

(a) (i) Berapakah banyak alamat host yang tersedia dalam rangkaian /24 tersebut?

(ii) Apakah jumlah bilangan alamat host yang diperlukan dalam gambar rajah topologi rangkaian di atas?

(iii) Berapa banyak subnet yang diperlukan dalam gambar rajah topologi rangkaian yang diberi?

(6/100)

(b) Isi maklumat perincian subnet-subnet rangkaian dalam jadual di bawah:

Lokasi	Antara muka	Antara muka alamat IP	Alamat IP yang diperuntukkan	Topeng Rangkaian (/XX)	Julat alamat IP
Bangunan A	G/0/0				
	G/0/1				
	G/0/2				
Bangunan B	G/0/0				
	G/0/1				

(20/100)

(c) Beri alamat IP, topeng rangkaian dan penghala lalai yang betul bagi konfigurasi rangkaian pada pelayan A.

(4/100)

3. (a) Terangkan secara ringkas **tiga** (**3**) komponen utama protokol halaan dinamik dan asas-asas operasinya.

(10/100)

(b) Jelaskan bagaimana operasi penghalaan keadaan pautan untuk penghala "Open Shortest Path First (OSPF)" mencapai keadaan penumpuan.

(8/100)

(c) Gambar rajah di bawah menunjukkan struktur Seni Bina Perniagaan. Pilih protokol penghala yang sesuai untuk digunakan dalam Kampus Teras. Justifikasikan jawapan anda.
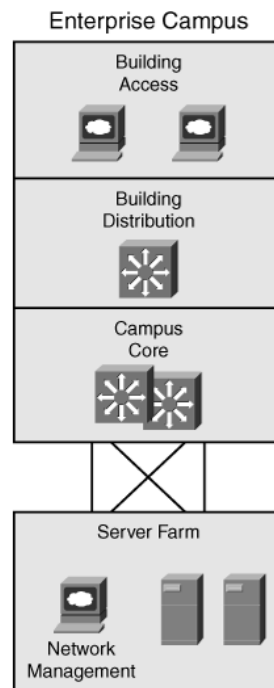

(7/100)

4. (a) Jelaskan secara terperinci bagaimana seorang jurutera rangkaian boleh menggunakan penghala untuk melindungi rangkaian daripada penggunaan yang tidak dibenarkan. Berikan contoh tugas-tugas yang boleh dilakukan dalam penerangan anda.

(6/100)

(b) Sebuah syarikat kecil telah menambah pelayan web untuk rangkaian bagi membolehkan pelanggan mengakses maklumat sulit seperti gambar rajah di bawah.
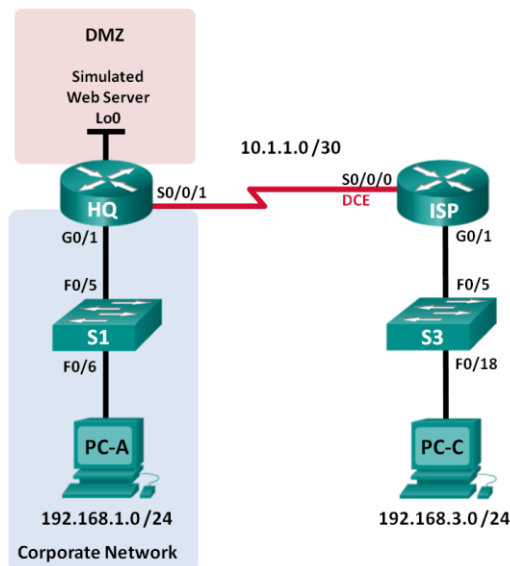
Jadual Alamat

Alatan	Antara muka keluar	Alamat IP	Subnet Rangkaian	Get lalai
HQ	G0/1	192.168.1.1	255.255.255.0	N/A
	S0/0/1	10.1.1.2	255.255.255.252	N/A
	Lo0	192.168.4.1	255.255.255.0	N/A
ISP	G0/1	192.168.3.1	255.255.255.0	N/A
	S0/0/0 (DCE)	10.1.1.1	255.255.255.252	N/A
S1	VLAN 1	192.168.1.11	255.255.255.0	192.168.1.1
S3	VLAN 1	192.168.3.11	255.255.255.0	192.168.3.1
PC-A	NIC	192.168.1.3	255.255.255.0	192.168.1.1
PC-C	NIC	192.168.3.3	255.255.255.0	192.168.3.1

Rangkaian syarikat dibahagikan kepada dua zon: Zon Rangkaian Korporat dan Zon Demiliterisasi (DMZ) seperti yang ditunjukkan dalam gambar rajah. Zon rangkaian korporat menempatkan pelayan swasta dan pelanggan dalaman. DMZ menempatkan pelayan web luaran diakses (disimulasikan dengan Lo0 di HQ). Reka bentuk Senarai Kawalan Akses (ACL) berdasarkan keadaan berikut:

• ACL 101 dilaksanakan untuk mengehadkan lalu lintas keluar dari zon rangkaian korporat. Zon ini menempatkan pelayan swasta dan pelanggan dalaman (192.168.1.0/24). Tiada rangkaian lain akan dapat mengaksesnya.

- ACL 102 digunakan untuk mengehadkan lalu lintas ke dalam rangkaian korporat. Hanya balasan kepada permintaan yang berasal dari rangkaian korporat dibenarkan kembali ke dalam rangkaian itu. Ini termasuk permintaan berdasarkan TCP host dalaman seperti web dan FTP. ICMP dibenarkan dalam rangkaian untuk tujuan penyelesaian masalah supaya mesej ICMP dihasilkan sebagai tindak balas kepada ping boleh diterima oleh hos dalaman.

- ACL 121 mengawal lalu lintas di luar ke DMZ dan rangkaian korporat. Trafik HTTP hanya dibenarkan ke web server DMZ (disimulasikan dengan Lo0 pada R1). Trafik rangkaian lain yang berkaitan seperti EIGRP, dibenarkan dari rangkaian luar. Lebih-lebih lagi, alamat persendirian dalaman seperti 192.168.1.0, alamat gelung balik seperti 127.0.0.0 and alamat multicast tidak dibenarkan memasuki jaringan korporat untuk mencegah serangan jaringan berbahaya dari pengguna di luar.

Nota: Semua ACL harus diterapkan ke penghala HQ kerana syarikat itu hanya boleh mentadbir penghala HQ sendiri.

(13/100)

(c) Apakah tujuan Protokol Konfigurasi Hos Dinamik (DHCP)? Beri **dua** (**2**) sebab mengapa konfigurasi rangkaian berasaskan DHCP lebih sesuai berbanding dengan konfigurasi static (manual).

(6/100)

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