

SULIT

UNIVERSITI MALAYSIA PERLIS

Peperiksaan Akhir Semester Pertama
Sidang Akademik 2025/2026

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IMC11403 – Computer Networks
[Rangkaian Komputer]

Masa : 2 jam

Please make sure that this question paper has **SIX (6)** printed pages, including this front page, before you start the examination.

[Sila pastikan kertas soalan ini mengandungi ENAM (6) muka surat yang bercetak termasuk muka hadapan sebelum anda memulakan peperiksaan ini.]

This question contains **FOUR (4)** questions. Answer **ALL** questions. Each question contributes 10 marks.

[Kertas soalan ini mengandungi EMPAT (4) soalan. Jawab SEMUA soalan. Markah bagi setiap soalan adalah 10 markah.]

(CO1, PO2, C3)

Question 1*[Soalan 1]*

- (a) In real-world communication paths, variations in link speeds influence how fast data can be delivered end to end. Suppose a data flow passing through three serial links of capacities 1 Gbps, 2 Mbps, and 100 Mbps:

[Dalam laluan komunikasi dunia sebenar, variasi dalam kelajuan pautan mempengaruhi seberapa pantas data dapat dihantar dari hujung-ke-hujung. Katakan satu aliran data melalui tiga pautan bersiri dengan kapasiti 1Gbps, 2 Mbps dan 100 Mbps:]

- (i) Explain which link acts as the bottleneck and why.

[Terangkan pautan manakah yang bertindak sebagai bottleneck dan sebabnya.]

(2 Marks/ Markah)

- (ii) Determine the value of maximum end-to-end throughput. Justify your answer.

[Tentukan nilai hasil maksimum hujung-ke-hujung. Berikan justifikasi anda.]

(2 Marks/ Markah)

- (b) Every IP address belongs to a specific class that defines its range and the number of hosts a network can support. Understanding the class structure helps in identifying network size and default mask configuration. Apply your understanding of IP addressing to:

[Setiap alamat IP tergolong dalam kelas tertentu yang menentukan julat alamat serta bilangan hos yang boleh disokong oleh sesuatu rangkaian. Pemahaman terhadap struktur kelas ini membantu dalam mengenal pasti saiz rangkaian dan konfigurasi topeng lalai. Gunakan pemahaman anda tentang pengalamatan IP untuk:]

- (i) Identify the class of IP address 192.168.20.5 and justify your answer.

[Kenal pasti kelas bagi alamat IP 192.168.20.5 dan berikan justifikasi kepada jawapan anda.]

(2 Marks/ Markah)

- (ii) Determine the default subnet mask and the maximum number of hosts supported in this network.

[Tentukan topeng subnet lalai dan bilangan maksimum hos yang disokong dalam rangkaian ini.]

(4 Marks/ Markah)

(CO1, PO2, C4)

Question 2

[Soalan 2]

Answer the following questions based on the given situation.

[Jawab soalan-soalan berikut berdasarkan senario yang diberikan.]

Suppose that the route from Alice's host to Bob's host is connected via 4 different links of 300 Kbps each. With the total of 10 packets, the first 5 packets have the same size of 100 bytes and the rest of the packets are half of that size. Note that the distance between host and routers and routers to routers are 150 km, and the speed of the transmission is 2.5×10^8 m/s. Suppose that before transmission of the first packet, some other packets are in the middle of transmission, so the first packet has to wait for 0.045 seconds.

[Anggap bahawa laluan daripada hos Alice ke hos Bob disambungkan melalui 4 pautan (links) yang masing-masing mempunyai kelajuan 300 Kbps. Terdapat 10 paket semuanya; 5 paket pertama mempunyai saiz yang sama iaitu 100 bait, manakala baki 5 paket lagi bersaiz separuh daripada itu. Diketahui bahawa jarak antara hos dan penghala (router) serta antara penghala ke penghala ialah 150 km, dan halaju penghantaran isyarat ialah 2.5×10^8 m/s. Andaikan sebelum penghantaran paket pertama, terdapat beberapa paket lain yang masih dalam proses penghantaran, maka paket pertama perlu menunggu selama 0.045 saat.]

(a) Calculate the queuing delay for the 5th packet.

[Kira kelewatan beratur (queuing delay) bagi paket ke-5.]

(4 Marks/ Markah)

(b) Calculate the total delay for the whole packets transmission.

[Kira jumlah keseluruhan kelewatan bagi penghantaran semua paket tersebut.]

(6 Marks/ Markah)

...4/-

(CO2, PO2, C4)

Question 3*[Soalan 3]*

Routers determine the outgoing path of each packet based on entries in their routing table. **Table 3.1** shows a simplified routing table in a router. Analyze the routing behaviour by answering the following questions.

*[Penghala menentukan laluan keluar bagi setiap paket berdasarkan entri dalam jadual penghalannya. **Jadual 3.1** menunjukkan jadual penghalan ringkas dalam sebuah penghala. Analisis tingkah laku penghalan dengan menjawab soalan-soalan berikut]*

Table 3.1*[Jadual 3.1]*

#	Network Prefix <i>[Awalan Rangkaian]</i>	Next Hop <i>[Hop Seterusnya]</i>
1	200.10.5.0/24	X
2	200.10.10.0/24	Y
3	0.0.0.0/0	Z

- (a) Determine the subnet mask for Subnet #1 and Subnet #2 based on the network prefixes shown in **Table 3.1**.

*[Tentukan topeng subnet bagi Subnet #1 dan Subnet #2 berdasarkan awalan rangkaian yang ditunjukkan dalam **Jadual 3.1**.]*

(2 Marks/ Markah)

- (b) Calculate the usable IP address range (excluding the network and broadcast addresses) for Subnet #1 and Subnet #2.

[Kira julat alamat IP yang boleh digunakan (tidak termasuk alamat rangkaian dan alamat siaran) bagi Subnet #1 dan Subnet #2.]

(4 Marks/ Markah)

- (c) Identify the next hop for each destination address below and justify your answer using the routing table:

[Kenal pasti hop seterusnya bagi setiap alamat destinasi di bawah dan berikan justifikasi berdasarkan jadual penghalan:]

(i) 200.10.5.140

(2 Marks/ Markah)

(i) 200.10.20.10

(2 Marks/ Markah)

....5/-

(CO2, PO2, C4)

Question 4*[Soalan 2]*

Answer the following questions based on the given situation.

[Jawab soalan-soalan berikut berdasarkan senario yang diberikan.]

Alice wants to send a confidential and authenticated message to Bob over the Internet. She considers two options:

[Alice ingin menghantar mesej yang sulit dan disahkan kepada Bob melalui Internet. Dia mempertimbangkan dua pilihan berikut:]

Option 1:*[Pilihan 1:]*

Using symmetric-key encryption (AES) with a shared key

[Menggunakan penyulitan kunci simetri (AES) dengan kunci yang dikongsi]

Option 2:*[Pilihan 2:]*

Using public-key encryption (RSA) with Bob's public key. Later, Alice also adds a digital signature and message authentication code (MAC) to enhance communication security.

[Menggunakan penyulitan kunci awam (RSA) dengan kunci awam milik Bob. Kemudian, Alice juga menambah tandatangan digital dan kod pengesahan mesej (MAC) bagi meningkatkan keselamatan komunikasi tersebut.]

- (a) Compare and analyze how **confidentiality**, **authentication**, and **integrity** are achieved differently in the symmetric and public-key approaches. Include an explanation of which cryptographic keys each party must possess and manage.

[Bandingkan dan analisis bagaimana kerahsiaan, pengesahan dan integriti dicapai dengan cara yang berbeza dalam pendekatan kunci simetri dan kunci awam. Sertakan penjelasan tentang kunci kriptografi yang perlu dimiliki dan diuruskan oleh setiap pihak.]

(6 Marks/ Markah)

- (b) Suppose Eve intercepts the message and attempts a man-in-the-middle attack during key exchange. Analyze how the use of digital certificates and a Certificate Authority (CA) helps prevent this attack.

[Anggap bahawa Eve memintas mesej tersebut dan cuba melaksanakan serangan orang di tengah semasa proses pertukaran kunci. Analisis bagaimana penggunaan sijil digital dan Pihak Berkuasa Sijil dapat membantu menghalang serangan ini.]

(4 Marks/ Markah)

....6/-

APPENDIX A
*[LAMPIRAN A]***CO – PO Information**
*[Maklumat CO – PO]***CO**

CO1	Ability to apply concepts and principles of computer networking
CO2	Ability to analyze problems related to computer networks.
CO3	Ability to demonstrate network design and configuration for diverse requirements.

PO

PO1	Analyze data, concepts, principles and theories relating to Data Science.
PO2	Apply appropriate concepts and methods for optimised Data Science solutions.

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