
UNIVERSITI SAINS MALAYSIA

Peperiksaan Semester Pertama
Sidang Akademik 2007/2008

Oktober/November 2007

EEE 442 – RANGKAIAN KOMPUTER

Masa: 3 jam

Sila pastikan bahawa kertas peperiksaan ini mengandungi **SEBELAS** muka surat dan **EMPAT** muka surat **LAMPIRAN** bercetak sebelum anda memulakan peperiksaan ini.

Kertas soalan ini mengandungi **ENAM** soalan.

Jawab **LIMA** soalan. --

Mulakan jawapan anda untuk setiap soalan pada muka surat yang baru.

Agihan markah bagi setiap soalan diberikan di sudut sebelah kanan soalan berkenaan.

Jawab semua soalan dalam bahasa Malaysia.

1. (a) Apakah dua perbezaan utama di antara penghantaran hop-ke-hop dan penghantaran hujung-ke-hujung? Gunakan gambarajah bersesuaian jika perlu.

What are two major differences between hop-to-hop delivery and end-to-end delivery? Use an appropriate diagram if necessary.

(20%)

- (b) Senaraikan lapisan-lapisan Model Internet. Huraikan dengan ringkas fungsi-fungsi setiap lapisan.

List the layers of the Internet Model. Explain briefly the functions of each layer.

(80%)

2. (a) Satu saluran hingar menghantar satu signal komposit yang boleh diuraikan kepada enam gelombang sinus dengan frekuensi 100, 250, 400, 550, 700 dan 850 Hz.

A noisy channel transmits a composite signal which can be decomposed into six sinus waves with frequencies of 100, 250, 400, 550, 700 and 850 Hz.

- (i) Jika semua gelombang sinus mempunyai amplitudè maksima 10 V, tuliskan persamaan lengkap untuk signal komposit tersebut.

If all sine waves have a maximum amplitude of 10 V, write a complete equation for the composite signal.

...3/-

- (ii) Kadar bit maksimum yang boleh dihantar melalui saluran tersebut jika nisbah signal-terhadap-hingar adalah 127.

Maximum bit rate that can be transmitted through the channel the signal-to-noise ratio is 127.

- (iii) Masa yang diperlukan untuk menghantar satu perkataan NETWORK dalam kod ASCII dengan menggunakan kadar bit maksima.

The time needed to sent out a word NETWORK in ASCII code by using the maximum bitrate.

(35%)

- (b) Satu siri bit dengan 8 bit dihantar menggunakan skim kod Differential Manchester seperti yang ditunjukkan dalam Rajah 2(a). Lukiskan bentuk signal dalam Lampiran A jika bit siri tersebut dihantar menggunakan skim-skim kod berikut:

(Andaikan signal sebelum $t=0$ adalah positif tinggi)

One bit series of 8 bits are transmitted using Differential Manchester coding scheme as shown in Figure 2(a). Draw signal form to represent the bit series in Appendix A if the bit series are transmitted using the following schemes:

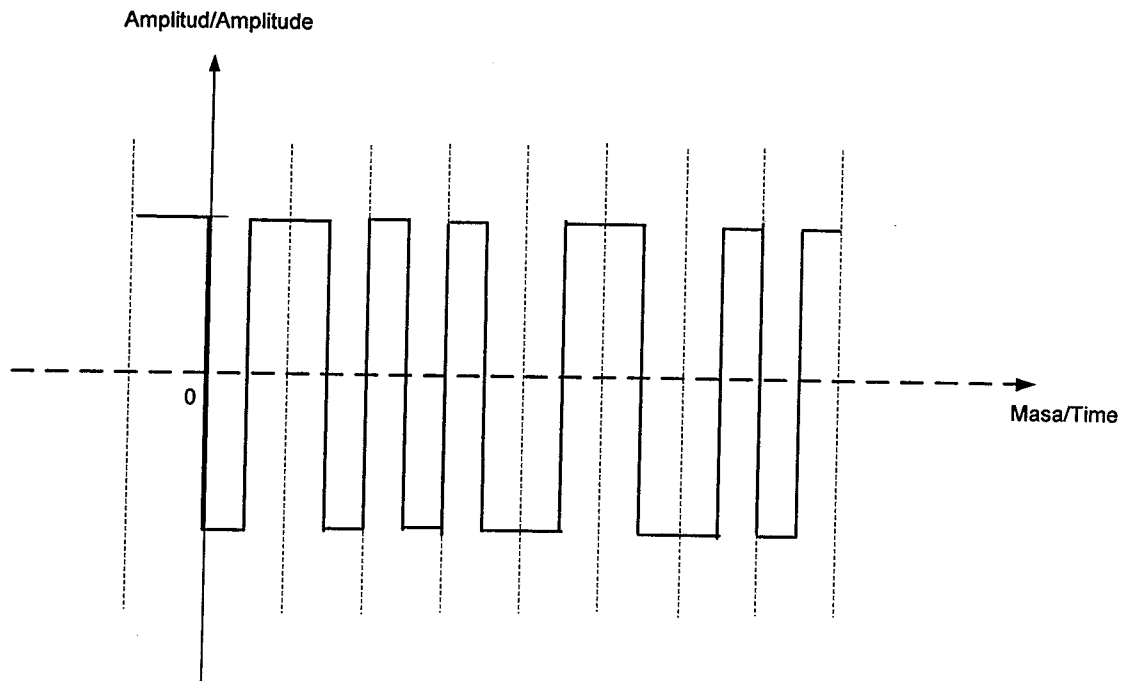
(Assume the signal before $t=0$ is positive high)

- (i) Manchester
- (ii) Multiline transmission three level
- (iii) Nonreturn-to-zero invert (NRZ-I)

Ceraikan Lampiran A dan hantar bersama-sama buku jawapan.

Detach and submit Attachment A with your answer booklets. (35%)

...4/-



Rajah 2(a)
Figure 2(a)

- (c) Terangkan dengan ringkas tiga jenis kerosakan penghantaran. Gunakan gambarajah-gambarajah yang bersesuaian jika perlu.

Explain briefly three types of transmission impairment. Use appropriate diagrams if necessary.

(30%)

3. (a) Satu siri bit 01111000 ditukarkan ke signal analog. Lakarkan signal analog dalam Lampiran B untuk penukaran berikut:

A bit series of 01111000 is converted into analog signal. Sketch the analog signal in Attachment B for the following conversion:

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- (i) Amplitude shift keying (ASK) dengan kadar baud 5 baud/s.
Amplitude shift keying (ASK) with baudrate 5 baud/s.
- (ii) Frequency shift keying (FSK) dengan kadar baud 10 baud/s.
Frequency shift keying (FSK) with baudrate 10 baud/s.
- (iii) 4-Phase Shift keying (PSK) (1 amplitud, 4 fasa) dengan kadar baud 2 baud/s.
4-Phase Shift keying (PSK) (1 amplitude, 4 phases) with baudrate 2 baud/s.

Ceraikan Lampiran B dan hantar bersama-sama buku jawapan.

Detach and submit Attachment B with your answer booklets.

(35%)

- (b) Lima signal membawa 200 aksara (dalam ASCII terpanjang) per saat dimultiplekskan bersama. Setiap slot masa mempunyai 2 aksara dan 1 bit penyegerakan diletakkan pada setiap kerangka. Dapatkan:

Five signals transmit 200 characters (in extended ASCII) per second are multiplexed together. Each time slot has 2 characters and 1 synchronizing bit is inserted to each frame. Find:

- (i) Kadar bit untuk setiap signal sebelum multipleks
The bit rate for each signal before multiplexing
- (ii) Durasi satu kerangka
The duration of a frame
- (iii) Kadar bit selepas multipleks
The bit rate after multiplexing

(35%)

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- (c) Banding dan bezakan dari segi konsep, kelebihan dan kekurangan di antara perambatan bumi, angkasa dan garis-penglihatan.

Compare and contrast in terms of concept, advantages and disadvantages between ground, sky and line-of-sight propagations.

(30%)

4. (a) Bincangkan kepentingan "flow control" dan "error control" dalam rangkaian komputer.

Discuss the importance of "flow control" and "error control" in computer networks.

(20%)

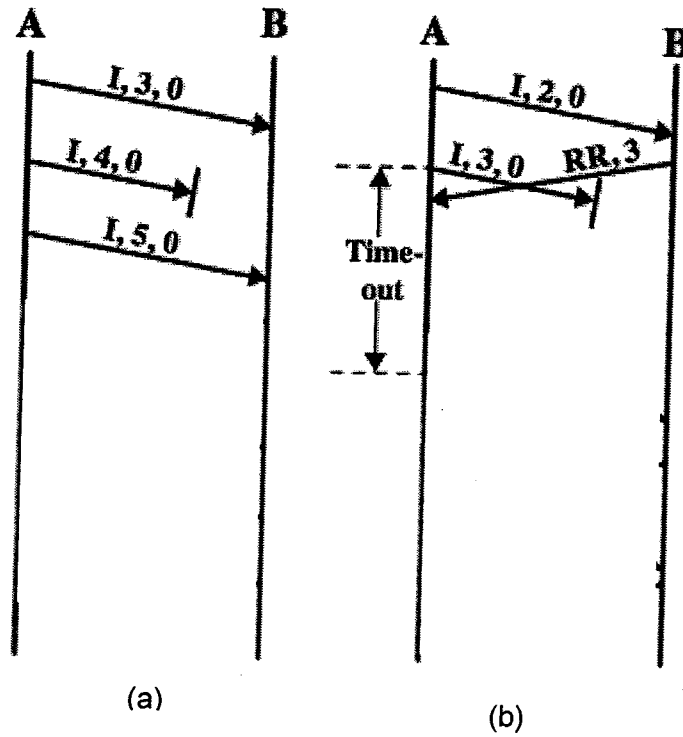
- (b) Secara ringkas, berikan definisi dan bezakan antara teknik " Stop-and-Wait" dan "Sliding-Window flow control" yang digunakan dalam rangkaian komputer.

Briefly define and differentiate between the operation of "Stop-and-Wait" and "Sliding-Window" flow control techniques used in computer networks.

(20%)

- (c) Rajah 4(a) dan (b) menunjukkan dua rajah siri masa yang menggambarkan dua kemungkinan senario pertukaran data antara dua stesyen (A) dan (B) menggunakan protocol "High Level Data Link Control (HDLC)".

Figure 4 (a) and (b) show two Time Sequence Diagrams depicting two possible scenarios of data exchange between two stations (A) and (B) using High Level Data Link Control (HDLC) protocol.



Rajah 4
Figure 4

- (i) Dalam scenario yang pertama [Rajah 4(a)], A menghantar kerangka informasi bernombor 3, 4 dan 5 kepada B. Kerangka informasi nombor 4 telah hilang dalam hubungan transmisi. Dengan menggunakan mekanisma "Go-Back-N Automatic Repeat Request (ARQ)", lengkapkan rajah siri masa untuk menunjukkan operasi dapat dipulihkan daripada kehilangan kerangka.

In the first scenario [Figure 4 (a)], A sends information frames number 3, 4 and 5 to B. Information frame number 4 has been lost in the transmission link. By employing the Go-Back-N Automatic Repeat Request (ARQ) mechanism, complete the Time Sequence Diagram to show how the operation can recover from a frame loss.

(30%)

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- (ii) Dalam scenario yang kedua [Rajah 4(b)], B telah berjaya menerima kerangka nombor 2 dan sedang bersedia untuk menerima kerangka nombor 3 daripada A. Walau bagaimanapun, kerangka nombor 3 telah hilang dalam hubungan transmisi. Dengan melengkapkan rajah siri masa, terangkan langkah baikpulihan yang boleh berlaku selepas had masa di A sudah tamat.

In the second scenario, B has successfully received frame number 2 [Figure 4(b)], and is ready to receive frame number 3 from A. However, frame number 3 has been lost in the transmission link. By completing the Time Sequence Diagram, explain the recovery steps that can occur after the timer in A has expired.

(30%)

5. (a) Berikan definisi dan bezakan antara rangkaian komputer berasaskan "circuit-switched" dan "packet-switched".

Define and differentiate between "circuit-switched" and "packet-switched" computer networks.

(20%)

- (b) Berikan definisi konsep "least cost routing", "distributed routing" dan "centralized routing" yang digunakan dalam rangkaian komputer.

Define the concepts of "least cost routing", "distributed routing" and "centralized routing" in computer networks.

(20%)

- (c) Bincangkan empat strategi haluan utama yang digunakan dalam rangkaian komputer "packet-switched".

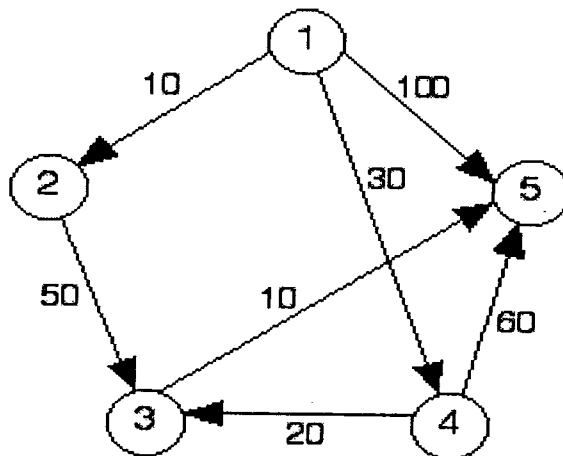
Discuss the 4 main routing strategies used in a packet-switched network.

(20%)

- (d) Rajah 5 menggambarkan satu rangkaian "packet-switched" yang merangkumi lima nod yang dilabelkan 1 hingga 5. Garisan beranak panah di antara sepasang nod mewakili hubungan antara nod-nod tersebut dan nombor berkenaan mewakili kos hubungan tersebut. Bina "Central Routing Matrix" untuk membolehkan teknik "fixed routing" digunakan.

Figure 5 illustrates a packet-switched network that consists of five nodes labeled 1 to 5. The arrowed lines between a pair of nodes represent a link between these nodes, and the corresponding numbers represent the current link cost. Construct the Central Routing Matrix to enable the implementation of a fixed routing.

(40%)



Rajah 5
Figure 5

...10/-

6. (a) Terangkan maksud kesesakan dalam rangkaian komputer. Apakah fungsi kawalan kesesakan?

Explain the meaning of "congestion" in computer networks. What is the function of a congestion control?

(10%)

- (b) Bincangkan empat teknik utama kawalan kesesakan yang digunakan dalam rangkaian komputer.

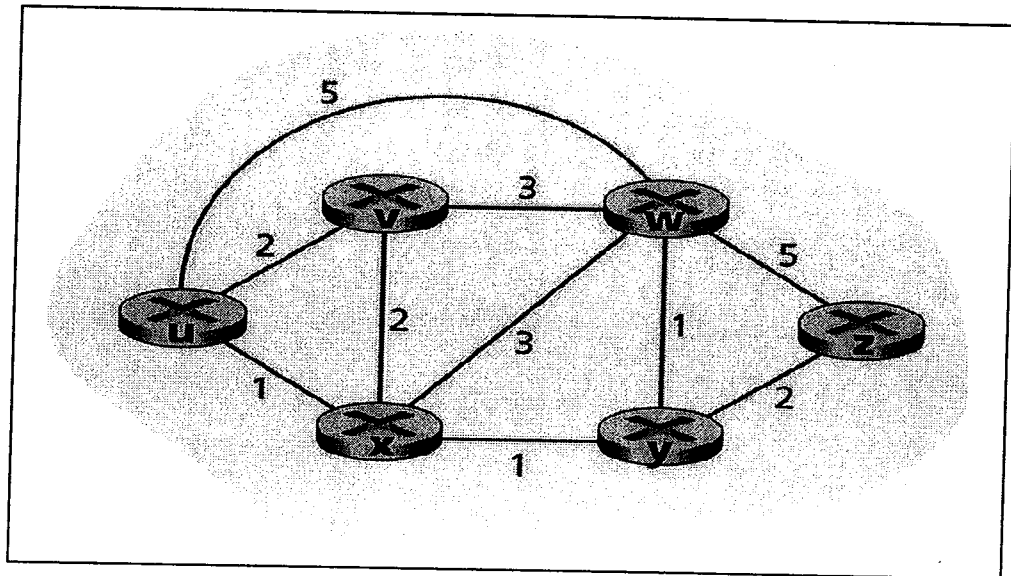
Discuss the four main congestion control techniques commonly used in computer networks.

(20%)

- (c) Rajah 6 menunjukkan satu rangkaian enam "router" (**u** ke **z**). Garisan di antara sepasang nod mewakili hubungan antara nod-nod tersebut dan nombor berkenaan mewakili kos hubungan. Gunakan algoritma Dijkstra untuk menubuhkan "least cost path" dengan router **u** sebagai nod pemula.

*Figure 6 shows a network of six routers (**u** to **z**). The lines between a pair of nodes represent a link between these nodes, and the corresponding numbers represent the current link cost. Apply Dijkstra's Algorithm to establish the least cost path beginning with router **u** as the source node.*

(30%)



Rajah 6
Figure 6

- (d) Bina semula "least cost path" untuk rangkaian dalam Rajah 6 menggunakan algoritma "Bellman-Ford".

Redevelop the least cost path for the network in Figure 6 using Bellman-Ford Algorithm.

(30%)

- (e) Bandingkan keputusan yang diperolehi oleh kedua-dua algoritma di atas.
Compare and contrast the results of the above two algorithms.

(10%)

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