COMP3331/9331

Tut 02

Rui

23T2

Final exam general info

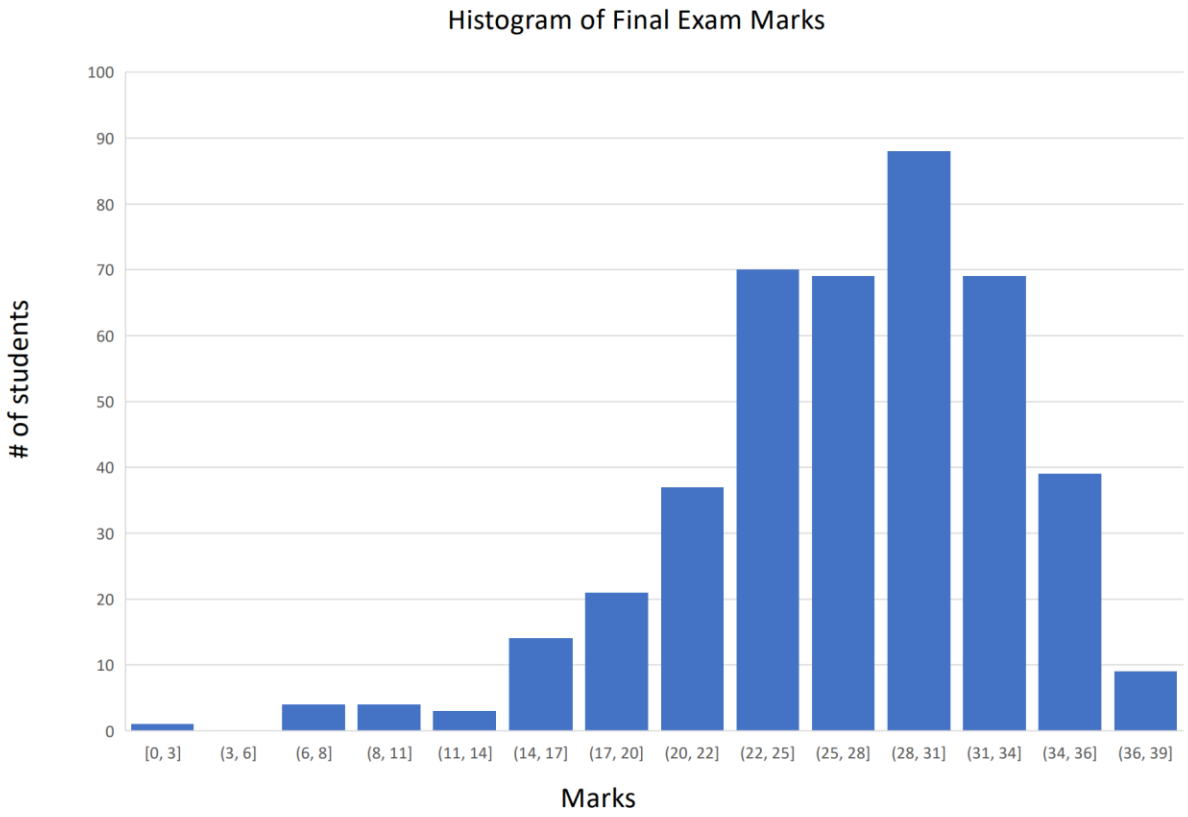
Time: TBD

- 2 hours + 15 minutes reading time
- Marks: **40 marks** (towards your final mark)
- Answer ALL questions, marks for each question will be noted
- **Hurdle:** must score at **least 40% (16 marks)** on the exam to pass the course

```
lab = marks for lab exercises (scaled to 20)
assign = marks for the programming assignment (out of 20 marks)
midTerm = mark for the mid-term exam (out of 20 marks)
finalExamScaled = scaled mark for the final exam (out of 40 marks)
mark = lab + assign + midTerm + finalExamScaled
grade = HD|DN|CR|PS if mark >= 50 && finalExamScaled >= 16
      = FL          if mark < 50
      = UF          finalExamScaled < 16
```

Final Exam Statistics

From last year



- 75% percentile (75% of students scored less than): 31.1
- 50% percentile (median, 50% of students scored less than): 27.65
- 25% percentile (25% of students scored less than): 23.3
- Average: 26.8

Question Type

Type	Level	Percentage
Multiple-choices	Easy	~20%
Calculation (Text entry)	Easy - Medium	~20%
Short answer/Essay	Medium – Hard	>60%

Tested area

Knowledge point	Possible question type	Percentage
TCP	All	~30%
IP	ALL	~35%
LinkLayer/Switches	Short Answer	~15%
Wireless	Short Answer	10~15%
Security	Short Answer	10~15%

Example question

- **Let's try some final exam question from last year?**

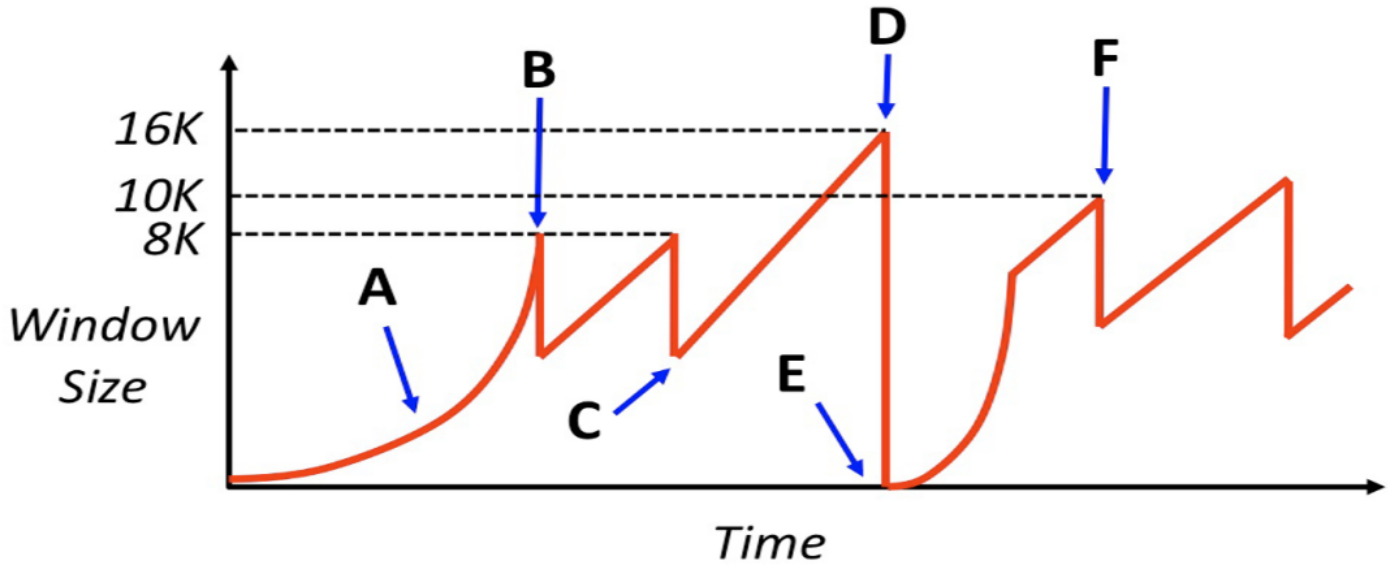
- **Wait... My experience!**
  https://myexperience.unsw.edu.au/unsw/

Tested area

- Transport layer (esp. TCP)
  - Calculation
  - Pipeline protocols
  - Congestion Control
  - Path
- Network layer (IP)
  - **Addressing**
  - **Fragmentation**
  - Allocation
  - Routing protocols and algorithms: link state, **distance vector**
- LinkLayer
  - **Switches**
- Wireless
  - frame collisions (RTC/CTS etc.)
- Security
  - Open minded question (free marks)

Example question

Consider the following graph of the congestion window (**NOT DRAWN TO SCALE**) of a TCP Reno connection where the y-axis describes the TCP window size of the sender (expressed in bytes) and the x-axis denotes time. Assume that the receiver advertised window for flow control is very large.



(1) The window size of the TCP sender decreases at several points in the graph, including those marked by B and D. (2 marks)

- Name the event at B that occurs that causes the sender to decrease its window.
- Does the event at B necessarily imply that the network discarded a packet (Yes or No)? Why or why not?

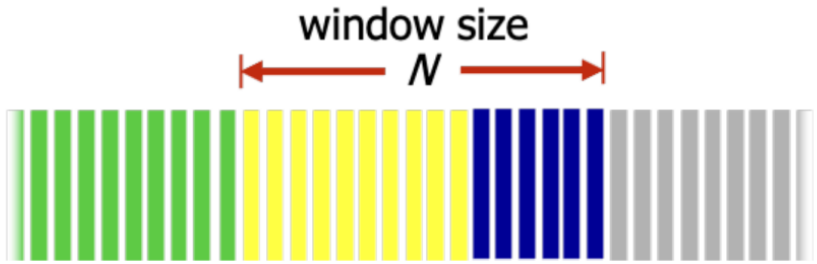
Example question

Assume the following colour scheme to denote packets as used in the lectures on pipelined protocols : Go-Back-N (GBN) and Selective Repeat (SR).

sent ACKed	sent, not-yet ACKed	usable, not yet sent	not usable

Assume a sender and receiver are communicating over an unreliable channel that may corrupt or loose packets and acknowledgements. The channel however does not reorder packets or acknowledgments.

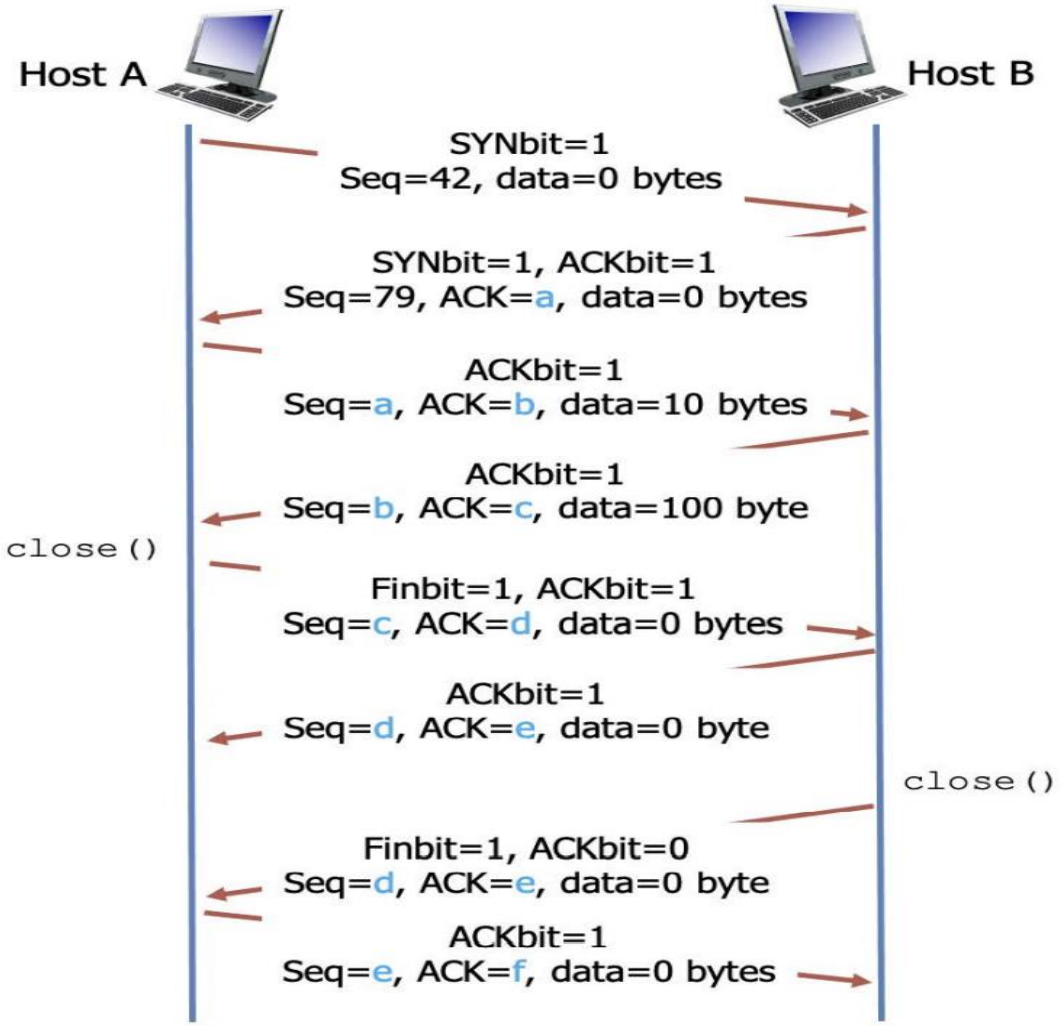
(1) The following picture depicts a snapshot at a particular time of the sender window and a part of the sequence number space. This is a valid example of which of the following:



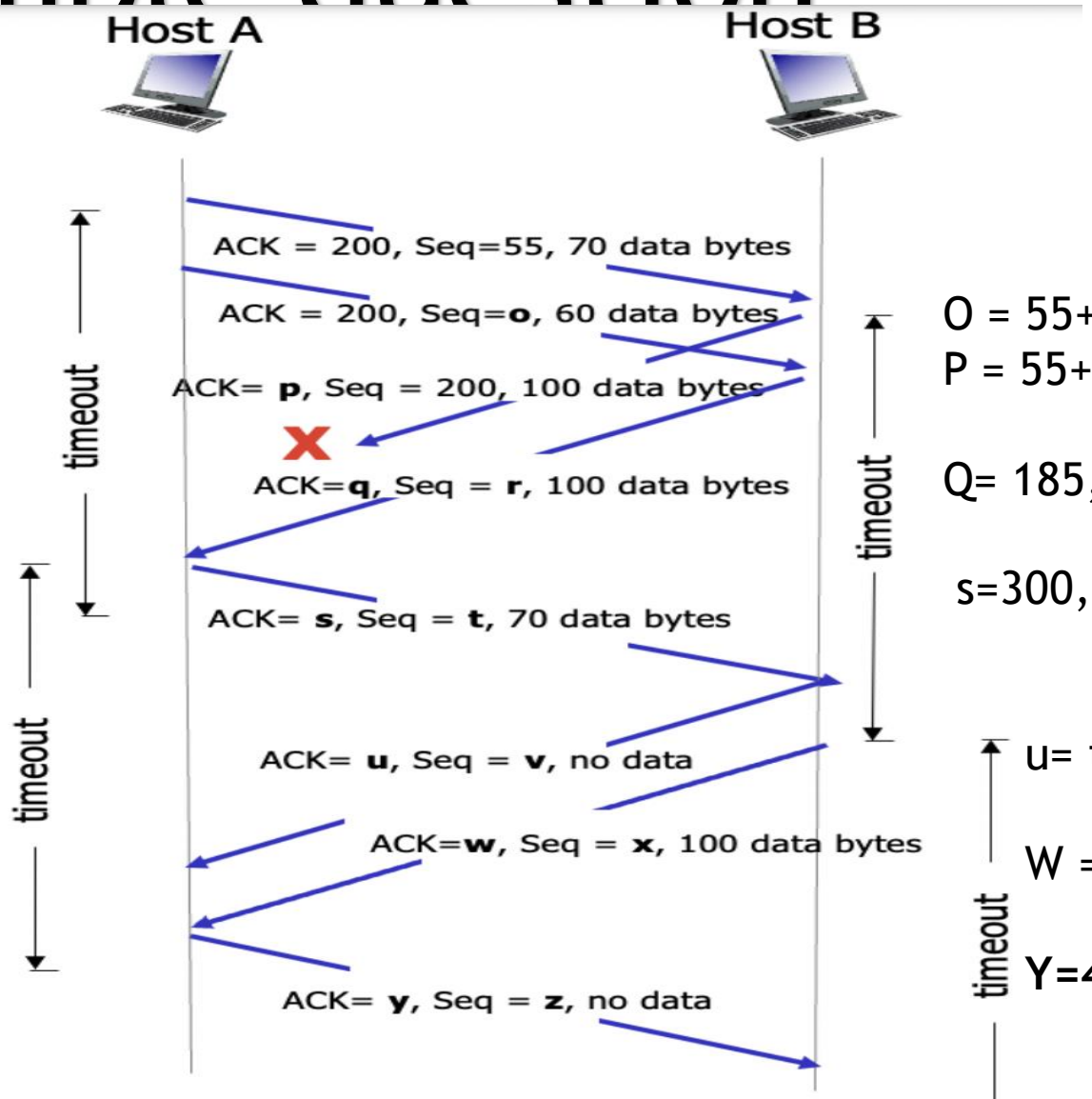
Select one alternative:

- Both GBN and SR sender.
- Only a SR sender.
- Neither GBN nor SR sender.
- Only a GBN sender.

Example question



Example question



O = 55+70

P = 55+70 = 125

Q= 185, r = 200

s=300, t = 185

u= t+70 = 255 v=s=**300**

W = 125 **X=200**

Y=400 Z=255

Example question

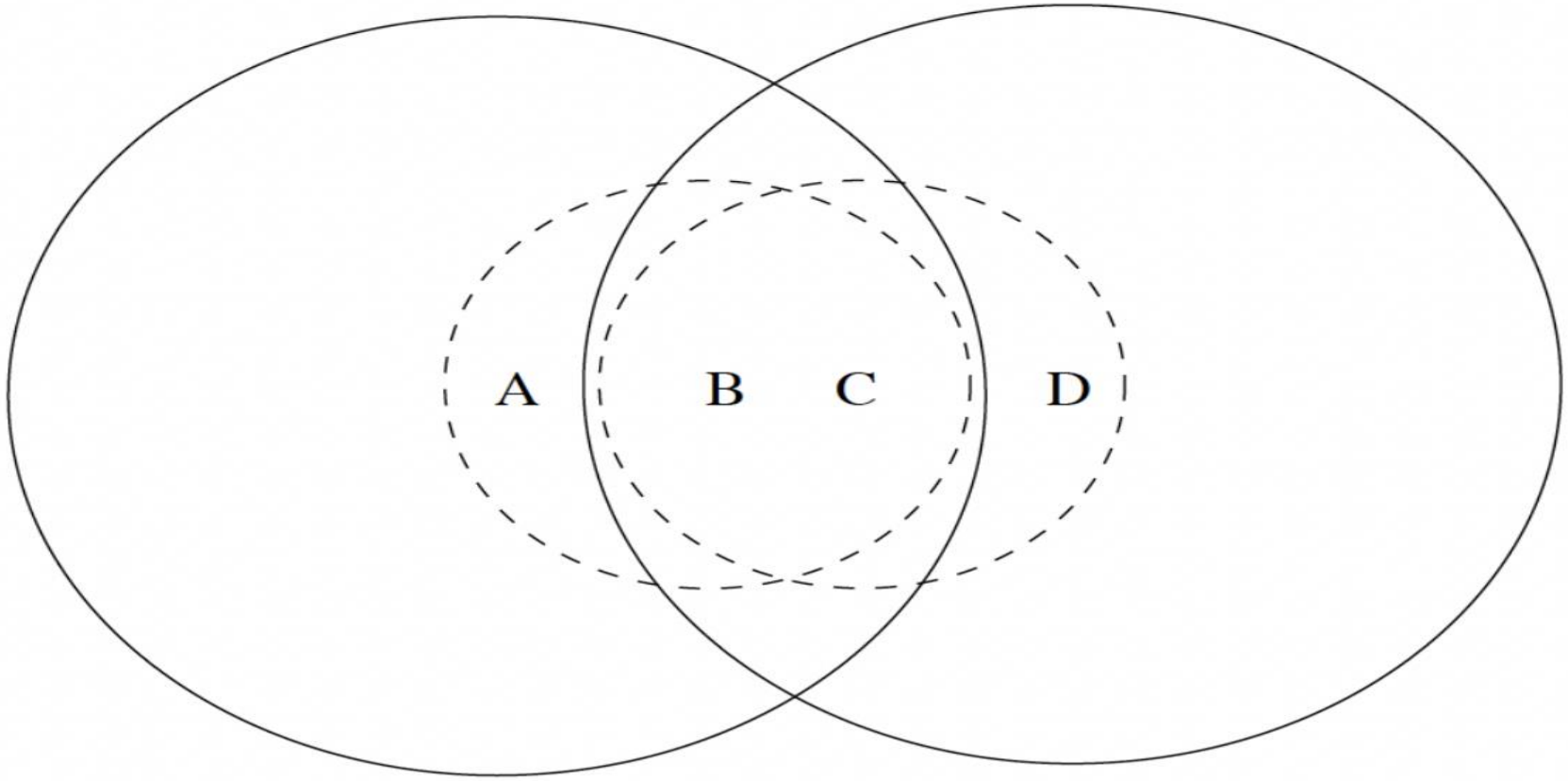
IP Address Aggregation

Assume that an ISP has 4 subscribers which have been allocated the following IP address blocks:

222.56.148.0/24
222.56.149.0/24
222.56.150.0/24
222.56.151.0/24

The ISP would like to aggregate the above blocks into a single address block and advertise this block for the purpose of routing. The advertised IP address block should not contain IP addresses that do not belong to the above 4 blocks of addresses.

Note down the advertised IP address block in the space provided below in the a.b.c.d/x format. No explanation is required.



Answer the following questions. Answers without proper explanations will not receive marks.

(1) When node A transmits to node B, list the potential hidden nodes from A (in either direction, i.e. those who might interfere with A's transmission or those who A's transmission might interfere with)? Explain your answer. (1.5 marks)

(2) Assume that all nodes are using the 802.11 MAC protocol with RTS/CTS enabled. Assume that C is currently transmitting to D and has reserved the channel as per the RTS/CTS protocol. Assume that node A wishes to transmit to node B while C is transmitting to D. Is this possible? Explain why or why not? (1.5 marks)

Example question

Assume that COMP3331/9331 also included weekly marked homework assignments (GULP!!). Salil and Ayda need to communicate to decide which tutor is going to grade the assignment for each week. They have a shared secret, K_grade that allows them to create unforgeable message authentication codes (MAC) so that Ayda can verify that Salil did in fact create any message that is received. Assume that this shared key has already been setup and that no one else knows the key. Salil and Ayda have a simple protocol: Ayda sends a “Who grades next week's homework?” message to Salil in plain text, and Salil replies with the message = (tutor name, MAC (tutor name, K_grade)). When Ayda receives the message, she verifies the MAC using K_grade and knows the name of the tutor who will grade the next homework. You may assume that a well-known and secure MAC algorithm is used.

Would it be possible for an enterprising tutor to hack this protocol and not have to mark a single homework? Clearly explain how the tutor would manifest such an attack or explain how no attack is possible. If the attack is possible, also propose a simple modification to the above described protocol to prevent the attack without making major changes.

You may assume that the tutor can hack into a router along the path taken by the messages exchanged between Salil and Ayda.