# EECS 325: Take Home Final

Shaochen (Henry) ZHONG, sxz517

Due and submitted on 05/01/2020
EECS 325, Dr. WANG

## Single Choice Questions

1. (i) c
   (ii) b
   (iii) a
   (iv) d
2. d
3. c
4. c
5. e

## Short Answer Questions

### 1

It will operate between Alice's email client and Alice's outgoing mail server; also Alice's outgoing mail server and Bob's incoming mail server.

### 2

IGP is for intra-AS routing, means navigating packets within the same AS; BGP is for inter-AS routing, means navigating packets across different AS.

### 3

When `cwnd` exceeds `ssthresh` ($\frac{1}{2}$ of current `cwnd`).
It is possible, when a timeout occurs or triple duplicate `ACK` is received (as some packets are getting through).

### 4

Yes.
A router's number of IP Addresses is equal to the number of interface it has to connect to different subnets. There will be no same IP Address used for multiple different subnets.

# IP Fragmentation

$\frac{2400-20}{700-20} = 3.5 \approx 4$. Thus, 4 fragmentations are generated.

| Seg Num | Length (bytes) | Flagflag | Offset |
|---|---|---|---|
| 1 | 700 | 1 | 0 |
| 2 | 700 | 1 | 85 |
| 3 | 700 | 1 | 170 |
| 4 | 360 | 0 | 255 |

# IP Addressing

- subnet 1: `223.1.13.0/25`
- subnet 2: `223.1.13.128/26`
- subnet 3: `223.1.13.192/26`

# Routing Algorithm

| S | N' | D(v), p(v) | D(w), p(w) | D(x), p(x) | D(y), p(y) | D(z), p(z) |
|---|---|---|---|---|---|---|
| 0 | u | 2, u | $\infty$ | 1, u | $\infty$ | $\infty$ |
| 1 | ux | 2, u | 4, x | 1, u | 2, x | $\infty$ |
| 2 | uxy | 2, u | 3, y | 1, u | 2, x | 4, y |
| 3 | uxyv | 2, u | 3, y | 1, u | 2, x | 4, y |
| 4 | uxyvw | 2, u | 3, y | 1, u | 2, x | 4, y |
| 5 | uxyvwz | 2, u | 3, y | 1, u | 2, x | 4, y |

The least-cost path is: $u \to x \to y \to z$

# Data Link Layer

## (a)

Known that $G = 10101$ and $r = 4$, now we have $\frac{D \cdot 2^r}{G} = \frac{110110101110000}{10101} = ...0011$
The CRC code will be `110110101110011`.

## (b)

No. Let the error be `10101`, we have $F(x) = 110110101110011$ and $G'(X) = x^4 + x^2 + 1$. Then we must have $\frac{F(x)+G'(x)}{G(x)} = \frac{G'(x)}{G(x)} = ...0$ in terms of the reminder. Thus, it cannot detect odd number of bit errors.

# Multiple Access Protocol

For $B$ to be success at any slot we have $P(B) = p(1-p)^2$ since $A$ and $C$ should not be success at this slot. Thus, for $B$ to be success for the first time in $S_4$, we have $(1 - P(B))^3 \cdot P(B) = (p(1-p)^2)^3 \cdot p(1-p)^2 = (1 - p(1-p)^2)^3 \cdot p(1-p)^2$.

# Course Evaluation

(b)