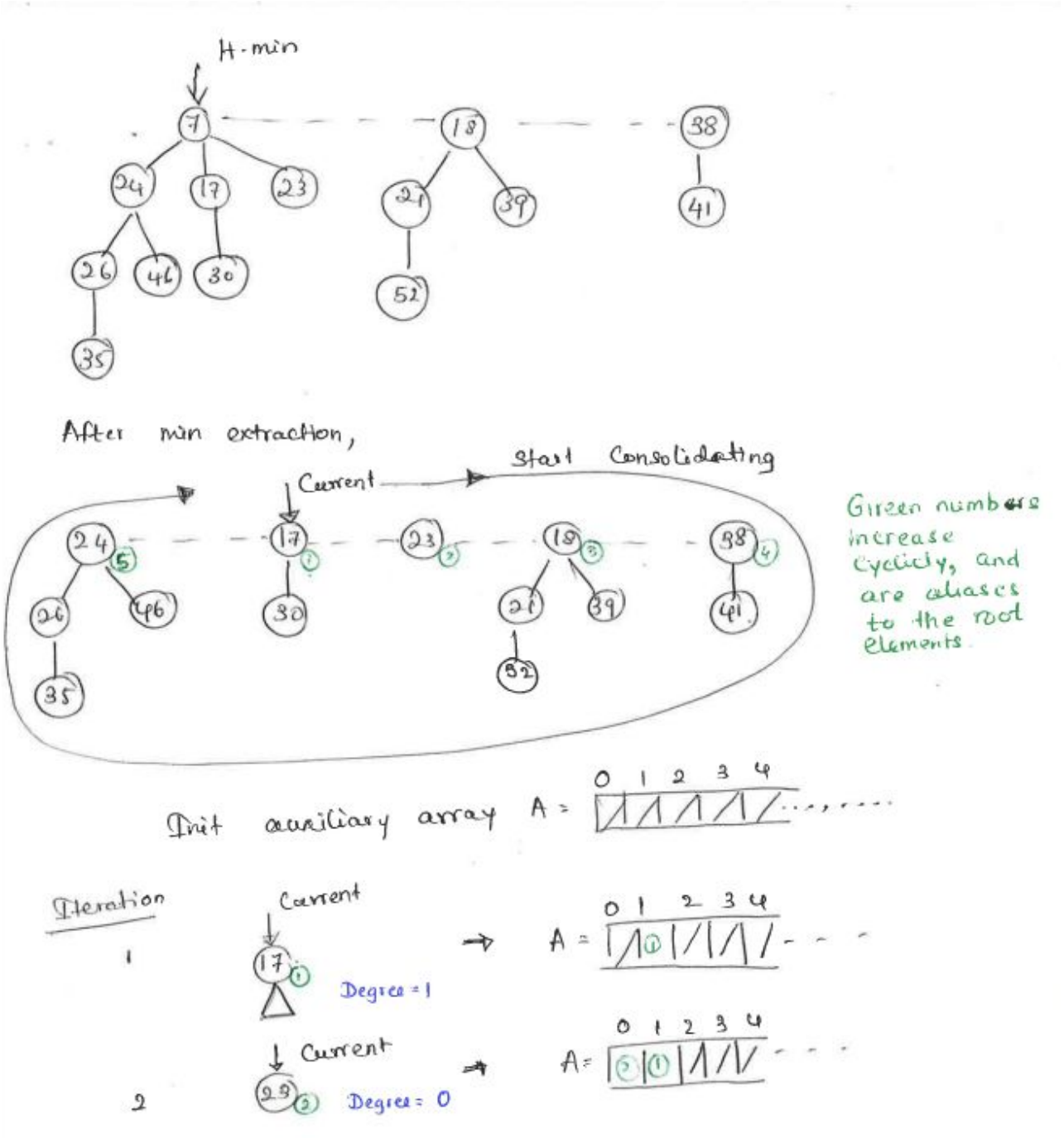
FIT3155: Week 7 Tutorial - Answer Sheet

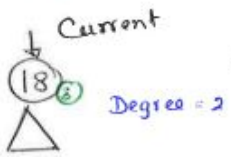
(Scribe: Dinithi Sumanaweera)

Question 2

Perform extract-min on the following Fibonacci heap:



3

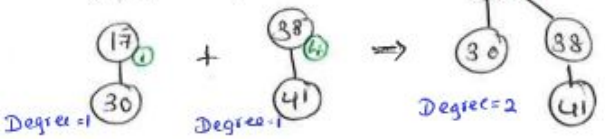


⇒

4

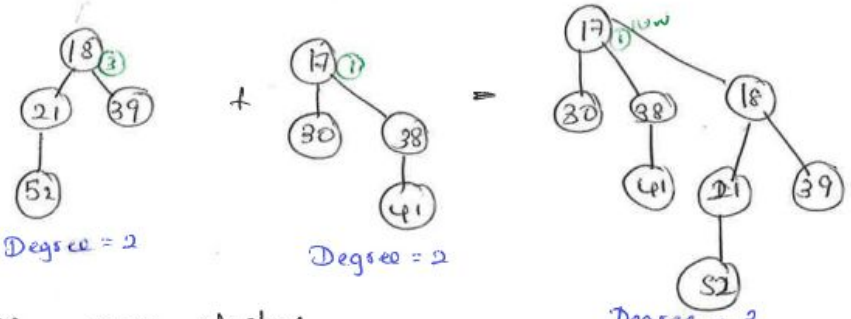
⇒ Clashes with A[1]

Resolve by merging.



⇒ Again clashes with A[2] that contains

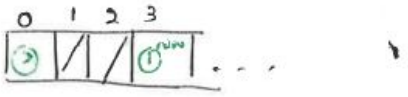
Resolve by merging



⇒ No more clashes

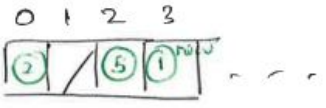
⇒ Populate in A[3]

⇒

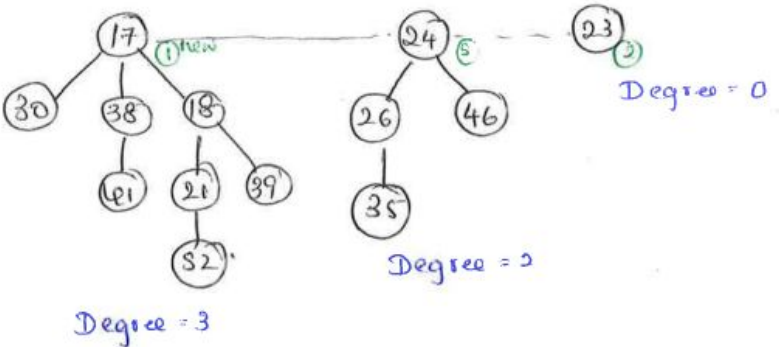


5

⇒

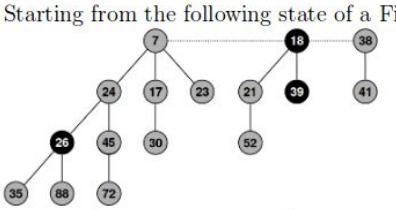


Final Heap :



Question 3

Starting from the following state of a Fibonacci heap:



Run the following sequence of operations, and after each step, draw the resultant heap:

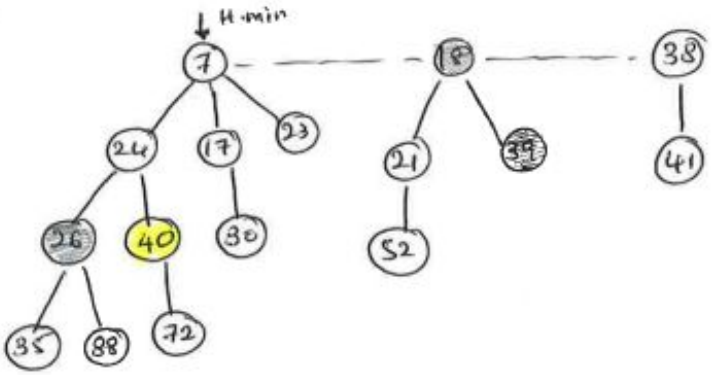
(a) `decrease-key` of 45 to 40.

(b) `decrease-key` of 40 to 12.

(c) `decrease-key` of 35 to 1.

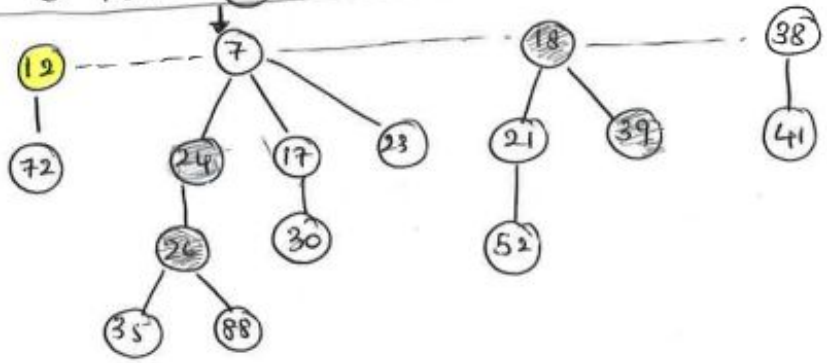
(d) `extract-min`.

(a). Changing (45) → (40) does not violate heap property.



(b). Changing (40) → (12) violates heap property.

∴ (1) Change (40) → (12)
(2) Cut Subtree rooted at (12) and promote to the root level
(3) Mark (24)



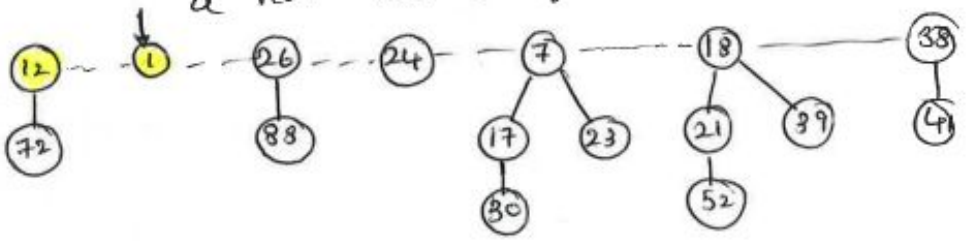
Changing (35) → (1) violates heap property

(c).

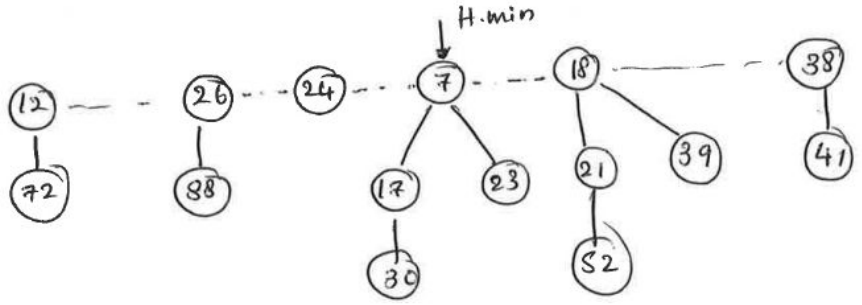
∴ (1). Change (35) → (1)

(2). Promote (1) to root level

(3). Since root of (26), is marked, the promoted leaf (prev.=(35)) which repeat the promotion to root process until a non marked parent node is reached.



(d). min extract ⇒ remove (1) results in following fibonacci heap.



Now ran consolidation as in the previous question

If consolidation ran in clockwise direction: