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**CSE585/EE555: Digital Image Processing II**

**Spring 2020**

**Exam #1 – Answer Sheet**

**Given**: 6:15PM – 9:00PM, Wednesday, 18 March 2020

|  |  |
| --- | --- |
|  | 1. 24 pts |
|  | 1. 10 pts |
|  | 1. 12 pts |
|  | 1. 18 pts |
|  | 1. 20 pts |
|  | 1. 16 pts |
|  | Total 100 points |

1. (24 points) Answer T (true) or F (false). For example, a. \_\_T\_\_
2. \_\_T\_\_\_
3. \_\_F\_\_\_
4. \_\_F\_\_\_
5. \_\_T\_\_\_
6. \_\_F\_\_\_
7. \_\_T\_\_\_
8. \_\_F\_\_\_
9. \_\_F\_\_\_
10. \_\_T\_\_\_
11. \_\_F\_\_\_
12. \_\_T\_\_\_
13. \_\_T\_\_\_
14. (10 pts) Binary morphology. Example answer: Ψ1(X) = \_\_a\_\_\_\_\_\_\_\_\_

Ψ1(X) = \_\_\_\_\_\_\_d\_\_\_\_\_\_\_\_\_

Ψ2(X) = there is no correct choice, it should first dilated by B then eroded by B to get the answer.

Ψ3(X) = \_\_\_\_\_\_\_a\_\_\_\_\_\_\_\_\_

1. (12 pts) Skeletonization.
2. What skeletal components *Sn(X)* do not equal the empty set?

n = \_\_\_\_\_\_\_\_\_\_\_1 and 2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is *skf(x,y)* when *(x,y)* is an element of  *S2(X)?*

*skf(x,y) = \_\_\_\_\_\_\_\_2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

1. *XB* can be written as the union of select skeletal components *Sn(X)* dilated by *nB.* Which components *Sn(X)* are these?

n = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_1 and 2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. (18 pts) Size Distribution and pattern spectrum
2. Area(X) = \_\_\_\_\_\_\_\_\_\_\_\_50\_\_\_\_\_\_\_\_\_\_\_\_
3. Fill in table below (type numbers in blanks)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| n | 0 | 1 | 2 | 3 |
| U(n) | 50 | 48 | 30 | 0 |
| f(n) | 0.04 | 0.36 | 0.6 | 0 |

1. (20 pts) Order-Statistics filtering
2. Give all possible values of “a” and “b”

a = \_\_\_\_\_\_\_\_\_\_\_\_\_\_1\_\_\_\_\_\_\_\_\_\_\_\_\_ b = \_\_\_\_\_\_\_\_\_\_\_\_1,2,3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Fill in blank values in table below for all *Ti(•), f(Ti(•)),* and *yk*

a = 1, b = 3

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| k | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |  |  | k | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |  |
| *xk* | a | 2 | 3 | 0 | 3 | 1 | 3 | b |  |  |  | X | 1 | 0 | 0 | 0 | 1 | 1 | X | *yk* |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *T3(•)* | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |  |  |  | X | 0 | 0 | 0 | 0 | 0 | 0 | X | *f(T3(•))* |
| *T2(•)* | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |  |  |  | X | 0 | 0 | 0 | 0 | 0 | 0 | X | *f(T2(•))* |
| *T1(•)* | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |  |  |  | X | 1 | 0 | 0 | 0 | 1 | 1 | X | *f(T1(•))* |

1. (16 pts) Stack filter.
2. Fill in the table below

|  |  |  |  |
| --- | --- | --- | --- |
| *xk-1* | *xk* | *xk+1* | *yk* |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |

1. Give the positive Boolean function for this filter.

*yk* = B =