DIP Monsoon 2018 Mid 1 Solutions

For MCQ Marking Correct Answer => Full Marks and Wrong Answer => 0 Marks (No exceptions)

1) A
alll-neighbors in N4 or N8 are 1 pixel away.

2) A, D
A – min filter has only min operation which only involves comparison
D – since 7*7 filter is given the median values will be the 25th value in the sorted values. Only comparison function required
B,C – requires division operator (See Assignmnet -1 q1)

3) B
Definition.

4) C – definition of laplacian
A, B – non-derivative opertors
D – first order operator

5) A
Although the matching technique uses cdf of h_A, the specification of target is in terms of desired histogram, which is a uniform distribution for histogram equalization.

6) A

7) B
For 1 pixel 6 bits (2^6 is 64)
32*32*6 = 6144

8) C
Each white block in the input image is such that height is roughly twice the width. The corresponding pattern in frequency spectrum is found in (C). (A) seems a bit likely, but the diagonal bands are too narrow and the interference patterns (off-diagonal stripes) do not really match with the input.
Additional info: translating the pattern does not change fourier transform. rotating the image rotates fourier transform.

9) A
cos(t) and sin(t) are periodic in 2pi. A and B are just amplitudes, C, D -- try using A = 0 or B = 0

10) A, C

In input image on left, gray value of IKEA lettering is 128. We want that to be black in output. The white oval and outer black rectangle need to be white in output.

11) Bilateral filter is non-linear filter.

a) Can Show an example on an two images.

Or

b) Disprove one property in general.

Marking Scheme:

If definition of bilateral filter is wrong or disproved by using different locations on a single image => 0 marks

Partial Mark Cases

If shown Non-linear for bilateral weighing filter and failed to show for bilateral function.

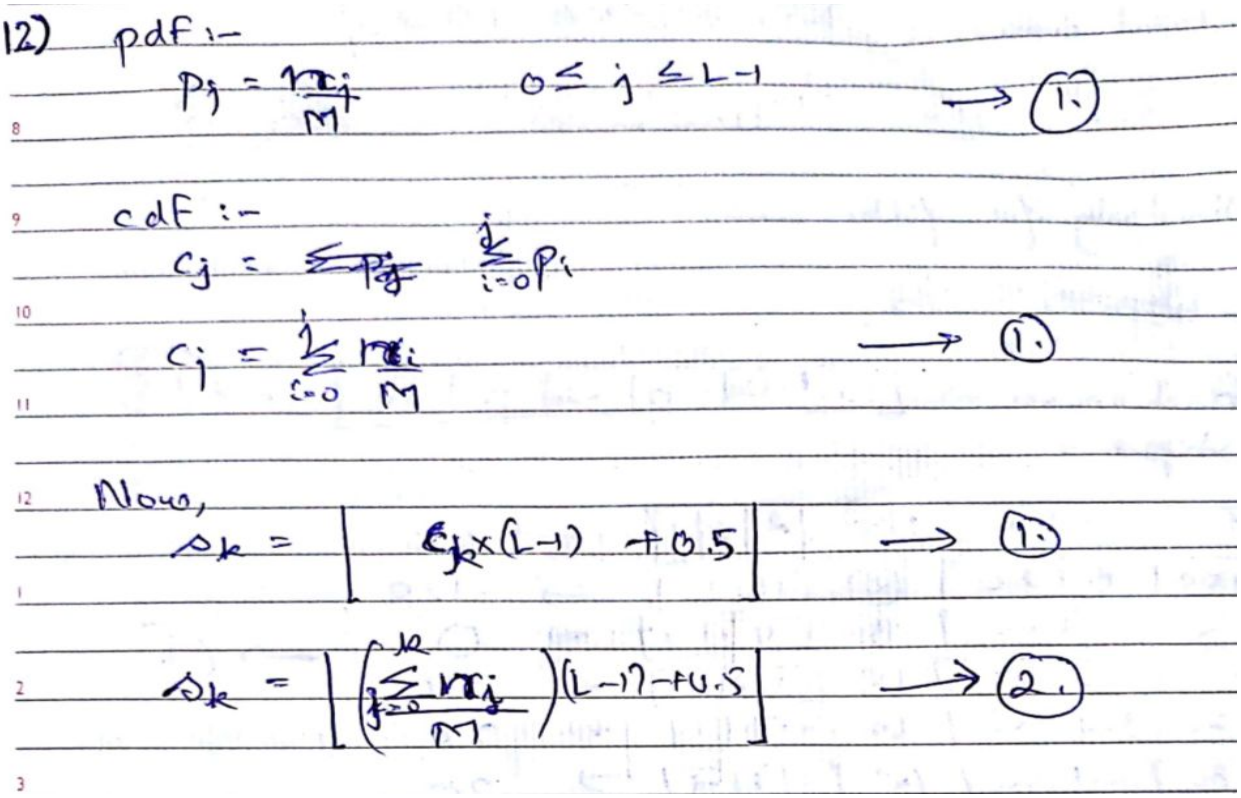
Proved one property while disproving another.

Shown an example on 1-D filters (in place of 2-D filters)

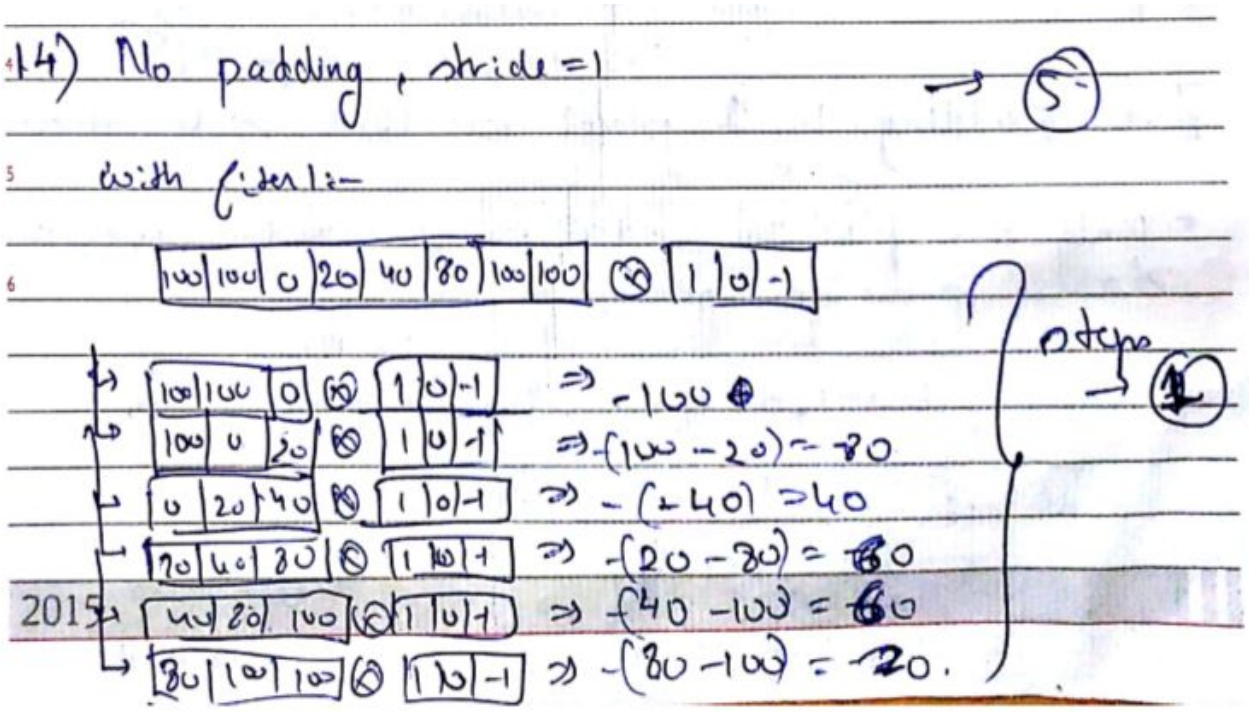
In accurate/ incomplete calculation/

Other technical Errors.

12.)



14.)



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WEDNESDAY

∴ final answer:- | -100 | -80 | 40 | 60 | -60 | 20 |

↳ final answer → 1.5

Similarly for filter 2:-

~~steps~~

final answer → | 100 | -120 | 0 | -20 | 20 | 20 | → 1.5

steps →

| 100 | 100 | 0 | ⊗ | -1 | 2 | -1 | → 100

| 100 | 0 | 20 | ⊗ | -1 | 2 | -1 | → -120

| 0 | 20 | 40 | ⊗ | -1 | 2 | -1 | → 0 → 1.

| 20 | 40 | 80 | ⊗ | -1 | 2 | -1 | → -20

| 40 | 80 | 100 | ⊗ | -1 | 2 | -1 | → 20

| 80 | 100 | 100 | ⊗ | -1 | 2 | -1 | → 20

→ 5.

Zero padding by 1 pixel on both sides, stride = 1

- only ~~one~~ pixel are added on both sides. everything else is same as previous one:-

∴ using filter-1; we get :- final answer 100

| +100 | -100 | -80 | +40 | +60 | +60 | +20 | -100 |

↳ | 0 | 100 | 100 | ⊗ | 1 | 0 | -1 | → +100 } left end

↳ | 100 | 100 | 0 | ⊗ | 1 | 0 | -1 | → -100 } right end

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similarly, for filter-2 :-

100	100	-100	0	-20	20	20	100

No padding, stride = 2 → (5)

↳ it will be equivalent to only taking alternative pixels in the result obtained in (1) part.

∴ answer:-

using filter-1 :- | +100 | +40 | +60 |

using filter-2 :- | 100 | 0 | 20 |

Zero padding by 1 pixel on both sides, stride = 2

↳ it will be equivalent to only taking alternative pixels in the result obtained in (2) part.

∴ answer :-

using filter-1 :- | +100 | -80 | +60 | +20 |

using filter-2 :- | 100 | -120 | -20 | 20 |

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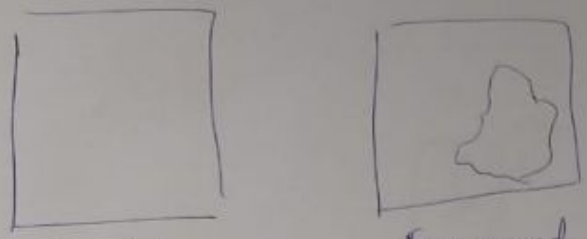
15.)



Input Image → in-im

Foreground Mask → fg-mask

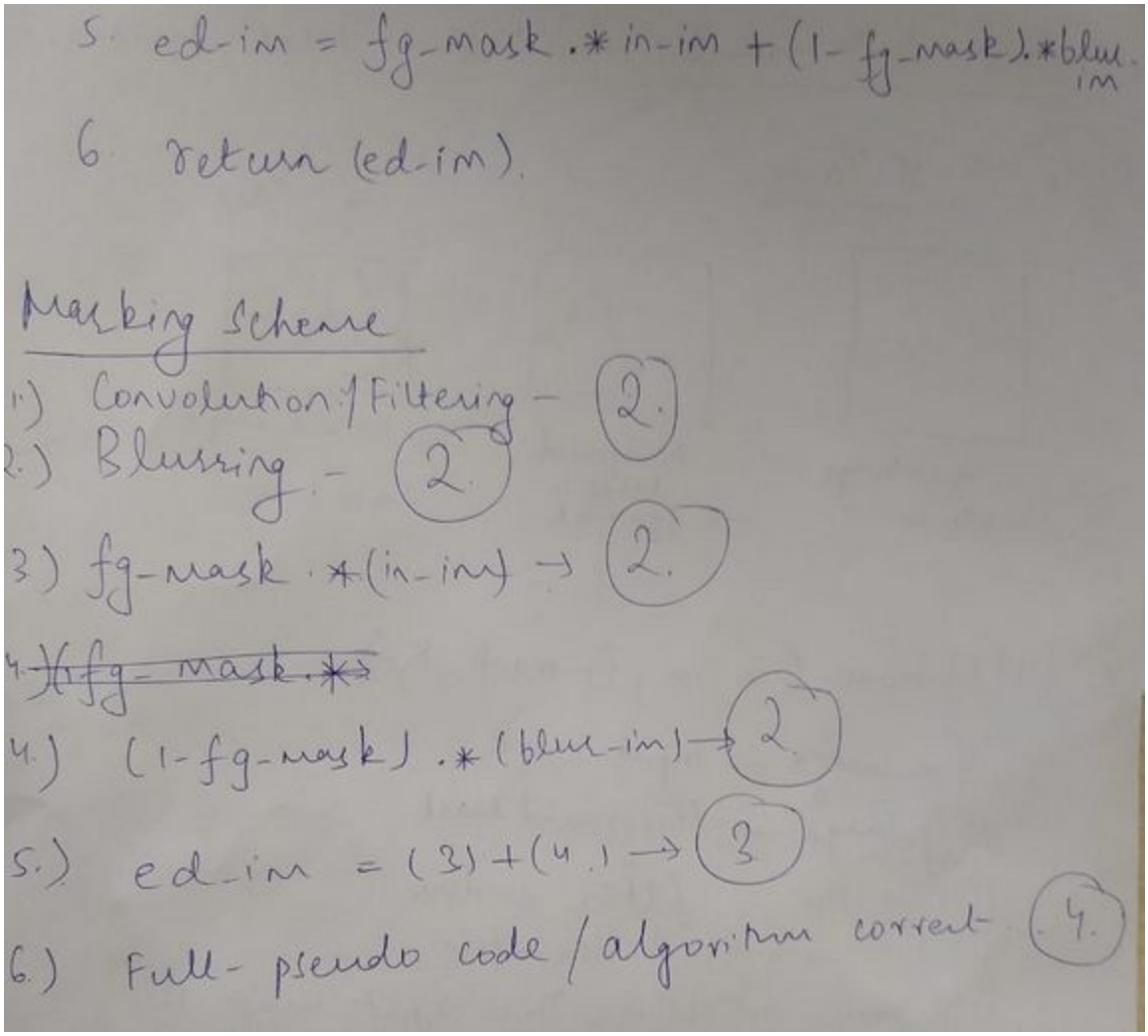
Edited image → ed-im

```
filterFunc (in_im, fg-mask, K, σ)
    // in_image → Input Image
    // fg-image → Foreground Mask
    // K → size of filter window.
    // σ → standard deviation.
    // Idea is to blur the input_image by
    // convolving with a gaussian filter of size K×K
    // and s.d. σ.

1. G = K×K gaussian filter with s.d. σ
   ( G(x,y) = 1/(2πσ²) e^(-(x²+y²)/(2σ²)) )

2. blur_im = in_im * G   // convolution.

3. fg-mask [fg-mask > 0] = 1
4. fg-mask [fg-mask ≤ 0] = 0   // Thresholding
```



13.)

Solution for this have yet to be updated