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INDIAN INSTITUTE OF TECHNOLOGY JAMMU

NH44, Nagrota, Jagti, Jammu-181221

Programme Name: M. Tech End Semester Examination

Course Name: Digital Image Processing Course Code: COL005P1M

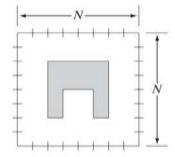
Duration: 3 Hours Max. Marks: 50

Note:

- All the questions are compulsory. You are free to make any assumption by clearly stating the conditions
- Please mention all the steps clearly
- 1) Consider a spatial mask that averages the four closest neighbours of a point (x, y) but excludes the point itself from the average.
 - (a) Find the equivalent filter H(u,v), in the frequency domain.
 - (b) Show that your result is a lowpass filter.
- 2) The white bars in the test pattern shown are 7 pixels wide and 210 pixels high. The separation between bars is 17 pixels. What would this image look like after the application of
 - I. A 3x3 arithmetic mean filter?
 - II. A 7x7 arithmetic mean filter?
 - III. A 9x9 arithmetic mean filter?
- IV. A 3x3 median filter?
- V. A 3x3 max filter?
- VI. A 3X3 min filter?



3) Segment the image shown by using the split and merge procedure. Let $Q(R_i) = True$ if all pixels in R_i have the same intensity. Show the quadtree corresponding to your segmentation.



4) Use the pixel based and the histogram comparison measures to find the shot transitions in the following 3 bit image frames of a video.

3	3	4	4	5
6	6	4	4	1
2	2	2	2	5
6	5	4	4	3
5	5	5	1	2

6	7	5	7	5
6	6	4	3	2
1	0	0	0	7
6	3	3	3	3
4	5	7	7	7

2	2	2	5	4
6	5	4	3	1
1	1	1	1	5
7	4	3	3	4
5	5	7	7	6

7	6	5	5	3
4	4	5	6	7
2	2	0	0	1
6	1	3	5	7
5	4	3	2	1

5) Assume that the frame instant is same as that of time instant of a video. Consider that the gray values in different frames of the video frames follows Gaussian distribution. Hence, considering initial three frames of the video construct the background model using P-finder based approach. Also find the motion information in 4th frame of the given video and update the background model.(Hint: Make any assumptions as required)

54	25	27	42
51	18	51	32
16	15	80	54
17	14	80	70

56	29	23	45
50	16	52	31
14	15	80	54
18	15	82	65

55	31	21	46
52	18	51	30
15	15	83	52
19	16	81	67

56	31	32	48
59	17	51	38
19	16	85	25
24	15	80	34