	EE4212 Computer Vision
	II, 2017/2018
	1 (25 marks)

(a) (7 marks: 4+3) left epipole: (1,0,0). Epipolar lines are all horizontal.

(b) (6 marks: 3+3) (i) Outlier (wrong matches) in the input correspondences (ii)Degenerate cases like pure rotation, planar scene

(c) (6 marks: 2+2+2) (i): There will be many outliers in the input due to the confusion caused by the repetitive pattern; (ii) large displacement cause appearance change in image features, again causing difficulty in image matching. There might only be a few matches with high reliability. (iii) no impact as images are taken at the same time (assuming no motion blur).

(d) (6 marks: 3+3) (i): No (ii) No, it requires additional condition such as the first 2 singular values being equal.

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	2 (25 marks)

a) (5 marks: 3+2) (i) (4,3) (ii) cannot be strictly true as the flow field should be expanding from a finite FOE.

b) (8 marks: 4+4) Rain streaks are not preserved across 2 time instances, thus violating BCC. Rain accumulation degrades the contrast of the image, thus accentuating the effects of noise.

c) (8 marks: 4+4) The residue image removes the effect of rain streaks due to the subtraction operation. However, the residue image suffers further loss of contrast which is detrimental to optical flow quality (especially if the background scene is also grey or near grey).

d) (4 marks) GCC is sensitive to the gradients caused by rain streaks and these gradients are not constant over time. On the other hand, it does reduce the effect of illumination change caused by lightning.

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	3 (20 marks)

(a) (2+2+2 marks) (i) 1/d+1/x=1/f here x is the solution; (ii) the zone of acceptable sharpness within a photo that will appear in focus (iii) The f-stops work as inverse values, such that a small f/number (say f/2.8) corresponds to a larger or wider aperture size, which results in a shallow depth of field; conversely a large f/number (say f/16) results in a smaller or narrower aperture size and therefore a deeper depth of field.

(b) (2+2+2 marks) (i) detect blob area; (ii) the blob will be smoothed; (iii) the image is smoothed at first.

(c) (1+2+1 marks) (i) zero (ii) B (iii) horizontal

(d) (2 + 2 marks) (i) generate textures block by block (ii) minimum difference cut to improve quality.

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	4 (30 marks)

(a) (1+2+2 marks). (i) randomly select the initial center (ii) calculate the distance between pixels to center; assign pixels to the center (iii) repeat the process until convergence.

(b) (2+2+2+2+2 marks) (i) interest point detection using blob detector; (ii) perform detection at multiple scale and find the stable point; (iii) use small patch centered at the detected interest point to calculate the gradient histogram; (iv) select the principal direction; (v) form the feature.

(c) (3+5+3+4 marks) (i) perform image pre-processing to remove noise and sharpen the edges; (ii) apply specifically designed filter to detect the knots (crossing points); (iii) post processing; (iv) to handle the distortion and different scales, need to combine filters with different size and different orientations.