DIP Course Assessment-2 (30 marks)

Please show all of the rough work, points will be deducted for not showing rough work even if the final answer is correct.

- **For descriptive answers, please answer to the point. Please don't write an essay.**
- **Late submissions will be penalised.**
- **Please write your name and roll number on the answer sheet and the filenames.**

1. Determine the noise probability density function in the given to you Fig1. and write down the expression of the PDF. Provide an estimate of the PDF parameters (3)
2. The white bars in the test pattern shown are 7 pixels wide and 210 pixels high (Fig2). The separation between bars is 17 pixels. What would this image look like after application of (a) A 3X3 arithmetic mean filter? (b) A 9 X9 arithmetic mean filter? Repeat Problem using a geometric mean filter and a harmonic mean filter. Give the expression for each case with short description (6)
3. In the given Fig3, remove noise by (a) median filter (b) wiener filter. Give the expression for each case with short description (4)
4. The objects within the binary image (Fig 4) are touching each other and hence it would not be possible to identify them as being different objects. Which morphological operation can help to approximately separate them? Apply, provide the operation and write in a few lines how it solves the problem. (5)
5. The objects given in the image (Fig5) were identified, however, some of them have holes within. Apply the appropriate methods and explain your answer. To the result, find the number of connected components within the image (5)
6. An image with non-uniform illumination (Fig6) has been given to you. You need to process this image further to recognise text within the image. However, prior to that a filtering step could help. Which filtering can used? Apply and explain. (4)
7. A preprocessing step in an application of microscopy is concerned with the issue of isolating individual round particles from similar particles that overlap in groups of two or more particles (Fig7). Assuming that all particles are of the same size,

propose a morphological algorithm that produces images consisting respectively of: Only non-overlapping particles. (3)