Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.Tech (EIE)/SEM-2/EIEM-205 B/2013

2013

REMOTE SENSING AND CONTROL

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. 5 × 14 = 70

1. a) What is photogrammetry and what are the information obtained from it ?

   b) A vertical aerial photograph is obtained over flat terrain with a 15-inch focal length camera lens from an altitude of 45,000 ft above ground level. What is the scale of the photograph ?

   c) Assume that two road intersections shown on a photograph can be located on a 1:25,000 scale topographic map. The measured distance between the intersections is 47.2 mm on the map and 94.3 mm on the photograph. What is the scale of the photograph ? At that scale, what is the length of a fence line that measures 42.9 mm on the photograph ? 3 + 4 + 7

2. a) Discuss the method of measuring height of an object based on stereoscopic aerial photography.

   b) The length of a line AB and the elevation of its end points, A and B, are to be determined from a stereo pair containing images "a" and "b". The camera used to take the photographs has a 152.4 mm lens. The flying height was 1200 mm (average for the two photos) and the air base was 600 m. The measure photographic co-ordinates of points A and B in the "flight line" co-ordinate system are x_a = 54.61 mm, x_b = 98.67 mm, y_a = 50.80 mm, y_b = – 25.40 mm, x_a' = 59.45 mm and x_b' = – 27.39 mm. Find the length of the line AB and the elevations of A and B. 6 + 8

3. a) What is remote sensing ? What are the different types of remote sensing ?

   b) Discuss about the interaction of Electromagnetic Radiation with the earth surface.

   c) What is atmospheric scattering ? Discuss different types of scattering. 4 + 4 + 6

4. a) Discuss about the remote sensing data collection.

   b) Discuss about the sensor resolution of a remote sensing system.

   c) What are the advantages and limitations of remote sensing system ? 4 + 5 + 5

5. a) Explain in brief the additive and subtractive principle of color image formation, mentioning the primary and secondary colors used.

   b) Explain in brief the principle involved in histogram equalization technique and hence outline a method of transforming an image with a given histogram to a desired one. 7 + 7

6. Consider the binary sub-image of size 4 × 4 at the centre of 8 × 8 image as shown in figure 1. Sketch the gradient image using approximation $\Delta f = |G_x| + |G_y|$, where G_x and G_y are obtained by Sobel operators $\begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix}$ and $\begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ 1 & 2 & 1 \end{bmatrix}$, repectively.

0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
0 0 1 1 1 1 0 0
0 0 1 1 1 1 0 0
0 0 1 1 1 1 0 0
0 0 1 1 1 1 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0

Figure – 1

7. a) What is the effect of high pass filtering to an image ? The figure 2 below shows a 5 × 5 image. Find out the output image obtained by a 3 × 3 high pass filter in the spatial domain.

4	3	5	2	6
2	5	7	2	4
5	6	8	7	8
8	4	8	6	3
2	5	9	6	7

Figure – 2

b) Describe the method of image sharpening. 10 + 4

8. Write short notes on any *two* of the following : 2 × 7

a) Enhancement of multispectral images

b) Radiometric correction on satellite images

c) Homomorphic filtering

d) 2-D discrete wavelet transform

e) K-means clustering.