1. (a) JPEG uses the Discrete Cosine Transform (DCT) for image compression.

   i. What is the value of F(0, 0) if the image $f(i, j)$ is as below?
   ii. Which AC coefficient $|F(u, v)|$ is the largest for this $f(i, j)$? Why? Is this $F(u, v)$ positive or negative? Why?

20	20	20	20	20	20	20	20
20	20	20	20	20	20	20	20
80	80	80	80	80	80	80	80
80	80	80	80	80	80	80	80
140	140	140	140	140	140	140	140
140	140	140	140	140	140	140	140
200	200	200	200	200	200	200	200
200	200	200	200	200	200	200	200

6. (a) How many principal modes does JPEG have? What are their names?

   (b) In the hierarchical model, explain briefly why we must include an encode/decode cycle on the coder side before transmitting difference images to the decode side.

   (c) What are the two methods used to decode only part of the information in a JPEG file, so that the image can be coarsely displayed quickly and iteratively increased in quality?

9. Unlike EZW, EBCOT does not explicitly take advantage of the spatial relationships of wavelet coefficients. Instead, it uses the PCRD optimization approach. Discuss the rationale behind this approach.