Show all your work and justify your answers.

1. Estimate the 35th percentile for the table below.

<table>
<thead>
<tr>
<th>Class intervals</th>
<th>frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 – 15</td>
<td>22</td>
</tr>
<tr>
<td>15 – 35</td>
<td>35</td>
</tr>
<tr>
<td>35 – 65</td>
<td>30</td>
</tr>
<tr>
<td>65 – 75</td>
<td>15</td>
</tr>
</tbody>
</table>

2. The probability of the closing of each relay in the circuits below is \( p \). If all relays function independently, what is the probability that a current flows between \( A \) and \( B \) for the two respective circuits.

3. A lie detector is known to be 90\% accurate on honest people and 95\% accurate on dishonest ones. This test is administered to a person selected at random from a population that is known to contain 85\% honest people and 15\% dishonest ones.
   a) If the test indicates that person is dishonest, what is the probability that (s)he is honest?
   b) What is the probability that the test indicates that the person is dishonest?

4. Four balls are selected at random from an urn that contains 4 red balls, 4 blue balls and 4 yellow balls. Compute the probabilities of the following events
a) All the balls in the sample have the same color;
b) Exactly two colors are represented in the sample;
c) All the balls in the sample have different colors.

5. The random variables $X$ and $Y$ have the joint distribution

$$f(x, y) = \begin{cases} cxy & 0 \leq x \leq y \leq 1 \\ 0 & \text{elsewhere} \end{cases}$$

a) Determine the value of $c$.
b) Determine the marginal density functions.
c) Are $X$ and $Y$ independent?
d) Evaluate $P[X > Y]$. 