

Signature (in ink): \_\_\_\_\_

Question	Marks	Question	Marks
<b>1</b>	12	<b>5</b>	15
<b>2</b>	22	<b>6</b>	10
<b>3</b>	12	<b>7</b>	7
<b>4</b>	7	<b>Total</b>	85

## Instructions:

- All code must be written in bash shell or C++, as appropriate.
- Your functions do not have to check for invalid inputs unless asked to do so.
- Functions you write may call:
  - Any function you have written in another part of the same question.
  - Any function we asked you to write for a previous part of the same question (even if you did not do that part).
  - Any other built-in function discussed in class, unless specifically noted in the question.
- Documentation is not required unless specifically requested.
- Header files are not required in C++ code.
- **You may not use:**
  - Any part of the C++ language or libraries that were not explicitly covered as course material.
  - Any C programming technique where an equivalent C++ programming technique exists.
- Ensure that this booklet contains 18 pages.
- Read through all the questions carefully.
- Each page of the exam contains a QR code in an upper corner. **Do not write on or near this square.** The page may not be marked if you write on or too closely to this code.
- Questions will not be answered. Proctors will only confirm or deny errors in the questions. If you consider the wording of a question to be ambiguous state your assumptions clearly and proceed to answer the question to the best of your ability. You may not trivialize the problem with your assumption.
- All Solutions must be placed in this booklet.
- For questions that use standard libraries you may assume the library has been included with a using namespace std statement.
- If you need more space to complete an answer, use the extra page at the back and indicate that you have done so in the original question.
- Don't Panic :-)