PNG UNIVERSITY OF TECHNOLOGY
DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

SEMESTER ONE EXAMINATION

CS415—Special Topics

MONDAY 6TH JUNE 2022

TIME ALLOWED: 3 HOURS

INSTRUCTIONS

1. Write your name and student number clearly on the front of the answer booklet.
2. There are five (5) questions in the Examination Booklet.
3. You have 10 minutes to read this paper. Please **do not** write during this time.
4. All answers must be written in the examination answer booklet.
5. Attempt All Questions.
6. Notes, mobile phones, textbooks and dictionaries are NOT allowed in this exam.
7. Use blue or black ink—not pencil or red ink.
8. **Do not write** anything or **turn this page** until you are told to do so.

Marking Scheme

Questions	Marks
Question 1	/15
Question 2	/12
Question 3	/13
Question 4	/14
Question 5	/20
Total	**/74**

Question 1: [3 + 3 + 3 + 3 + 3 = 15 marks]

a) What is the role of middleware in a distributed system?

b) Explain what is meant by (distribution) transparency and name two examples of different types of transparency.

c) Why is it sometimes so hard to hide the occurrence and recovery from failures in a distributed system?

d) Describe precisely what is meant by a scalable system.

e) When a transaction is aborted. We have said that the world is restored to its previous state as though the transaction had never happened. We lied. Give an example where resetting the world is impossible.

Question 2: [3 + 3 + 2 + (1 + 1 + 1 + 1) = 12 marks]

a) Briefly describe how the TCP protocol is more reliable than the UDP protocol.

b) UDP protocol packet-oriented protocol. What does it mean by packet-oriented?

c) Name two object-orient technologies in Java that has have emerged as leading solutions for creating portable, efficient, and maintainable large and complex Internet applications

d) What are the default port numbers for the following protocol?
   (i)   ftp
   (ii)   telnet
   (iii)   smtp
   (iv)   https

Question 3: [3 + 3 + 4 + 3 + 4 = 13 marks]

a) How is a service hosted by server identified by a client?

b) A computer can host more than one services. How does the host know which Internet packets belong to which services running on the computer?

c) An RMI architecture is similar to the traditional socket-based client server architecture. Describe the differences between them in terms of the client and server applications.

d) What is the purpose of the RMI registry? [4 marks]

e) What are stub and skeleton in the RMI architecture? Explain their respective functions.

Question 4: [6 + 8 = 14 marks]

a) Create a server class in Java which listens to client connections on port number 1234.Your server program should send "Hi Tom" to the client.

b) Below is class called `Doubler` that implements an interface called `DoublerInterface` that defines basic arithmetic operations using the RMI framework that we discussed in the lectures.

```java
public interface DoublerInterface extends Remote{
        public int DoubleIt(int x) throws RemoteException;
        public int Product(int x,int y) throws RemoteException;
}

public class Doubler extends UnicastRemoteObject implements DoublerInterface
{
        public Doubler() throws java.rmi.RemoteException{
            super();
        }

        public int DoubleIt(int x) throws RemoteException {
            return (2*x);
        }

        public int Product(int x, int y) throws RemoteException {
            return x*y;
        }
}
```
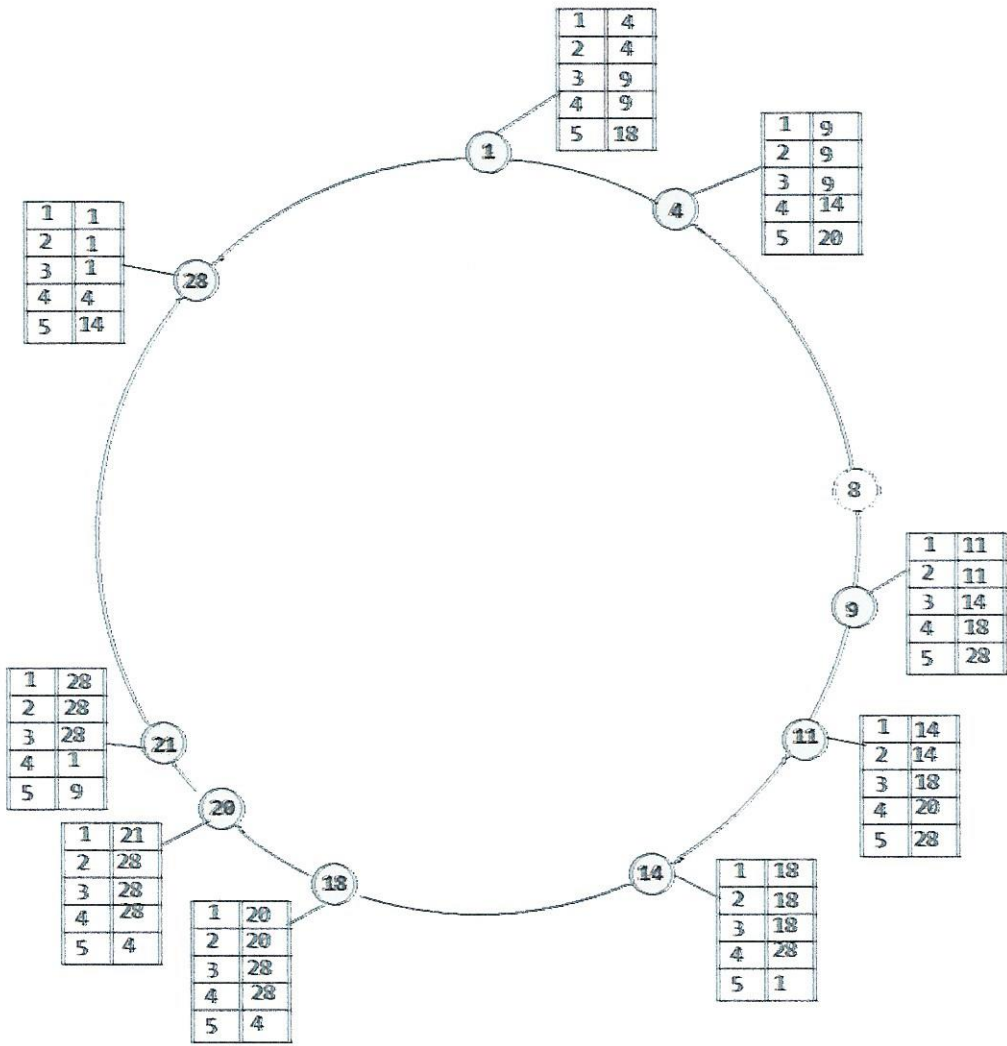
Create a class called RmiArithmeticServer and implement the server side logics for the RMI server class.

Question 5: [4 + 2 + 4 + 10 = 20 marks]

Consider the chord system given in the figure below with a 32-bit space.

Node 1 finger table:

1	4
2	4
3	9
4	9
5	18

Node 4 finger table:

1	9
2	9
3	9
4	14
5	20

Node 9 finger table:

1	11
2	11
3	14
4	18
5	28

Node 11 finger table:

1	14
2	14
3	18
4	20
5	28

Node 14 finger table:

1	18
2	18
3	18
4	28
5	1

Node 18 finger table:

1	20
2	20
3	28
4	28
5	4

Node 20 finger table:

1	21
2	28
3	28
4	28
5	4

Node 21 finger table:

1	28
2	28
3	28
4	1
5	9

Node 28 finger table:

1	1
2	1
3	1
4	4
5	14

a) Explain how a node determines its finger table in the chord system.

b) Suppose that I submit a query at node 4. Which node in the ring would be responsible for key 31?

c) What is the finger table for node 8 if it joins the network? Show clearly how you compute the second entry of the finger table.

d) Which other nodes' finger tables will be changed, and what are their new finger tables?

....END OF EXAMINATION..