UNIVERSITI TEKNOLOGI MARA
FINAL ASSESSMENT

COURSE	**:**	**PARALLEL PROCESSING**
COURSE CODE	**:**	**CSC580**
EXAMINATION	**:**	**FEBRUARY 2022**
TIME	**:**	**3 HOURS**

INSTRUCTIONS TO CANDIDATES

1. This question paper consists of five (5) questions. Answer ALL questions in English.

2. Answer ALL questions in the answer sheet. Start each answer on a new page. Write your name, id, and group on the answer sheet.

3. No discussion is allowed, and do not share your answers with other students. Any copying of or plagiarized answers will be marked with 0 (zero).

4. Include ALL ANSWERS on the answer page and save it as a .pdf file. Complete the submission. The submission page will be closed at 5.15 PM.

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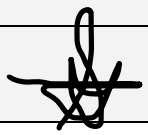
Student signature:	

QUESTION 1 (25 MARKS)

a)

Software portability	It can be created on a serial machine and then executed on a parallel machine with no modifications.
Variety of available methods of communication	In terms of cost, time, and impact, a specific way will be more effective, and it will be more suited in some cases.
Immediate or real-time response	-The amount of time it takes to process data is small. - The information is current and can be used right away.

b) Types of programming models

1)Process base models	Unless otherwise specified, assume that all data connected with a process is private (local memory).
2)Directive based programming models	Facilitate the generation and synchronisation of threads to extend the threaded model.
3)Lightweight processes and threads	Assume that all memory is global and that all threads can access it.

The importance of programming models in shared-address spave architecture is programming models will focus on construct for expressing concurrency and synchronization.

c) Describe any TWO (2) advantages for each Floyd algorithm and Kruskal algorithm.

Floyd Advantage	Kruskal Advantage
- Can be use to determine the shortest pathways between all pairs of vertices in a graph where each edge can have either positive or negative weight. - In O(V3), where V is the number of vertices in a network, all the shortest distances between any two vertices might be determined.	- This approach can aid in the creation of a solution from the cheapest edge by combining the cheapest existing tree or forest. - The tree that is used to grow the graph is frequently unconnected, making this technique faster for sparse graphs.

QUESTION 2 (20 MARKS)

a) - Number of processing elements
- Input Size
- Communications parameters

b) Thread is a single sequential flow of task execution in a process, and it is also known as a thread of execution or a thread of control. There is a manner of thread execution inside the process of any operating system. Aside from that, several threads can exist within a process.

Join	Suspend	Interrupt
- Join is a synchronisation technique that stops the calling thread (that is, the thread that calls the method) until the thread whose Join method is invoked has completed. To ensure that a thread has been killed, use this technique.	-The thread class's suspend function puts the thread in a waiting state. When a specific event occurs, this method is used to stop the thread execution and restart it. This technique allows a thread to pause execution for a short period of time. The resume() method can be used to restart a suspended thread.	-An interrupt tells a thread to stop doing what it's doing and start doing something else. The programmer has complete control over how a thread reacts to an interrupt, however it is fairly typical for the thread to terminate.

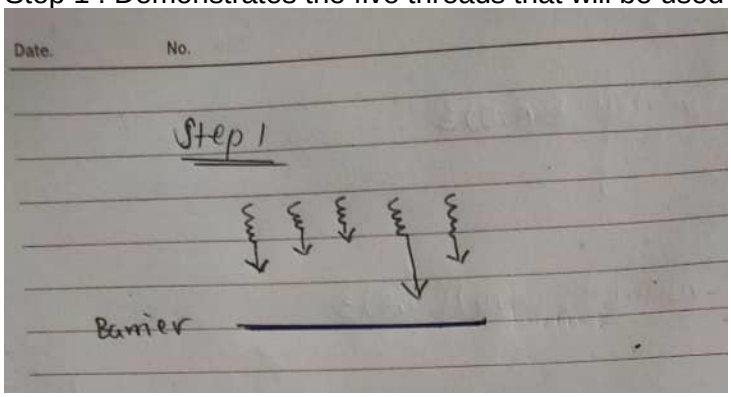
c)

Effectiveness	Convenience
Few programmers would bother writing their own tree-style broadcast communication system when there are efficient, well-tested alternatives.	It is simple to use because there are a variety of communication ways that require participation from all processes in a communicator.

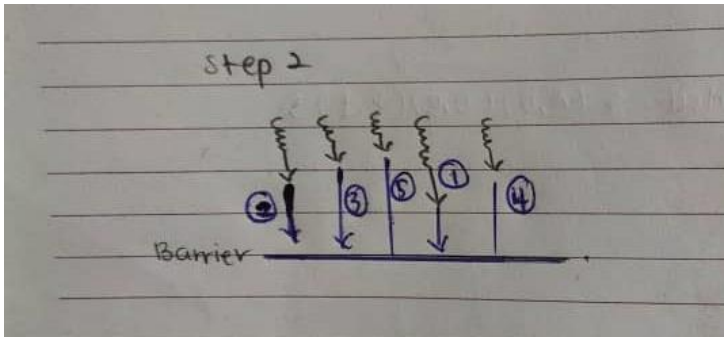
QUESTION 3 (15 MARKS)

a) The barrier is significant in parallel computation because it improves synchronisation, allowing several threads to wait until all of them have reached the same point of execution before continuing.

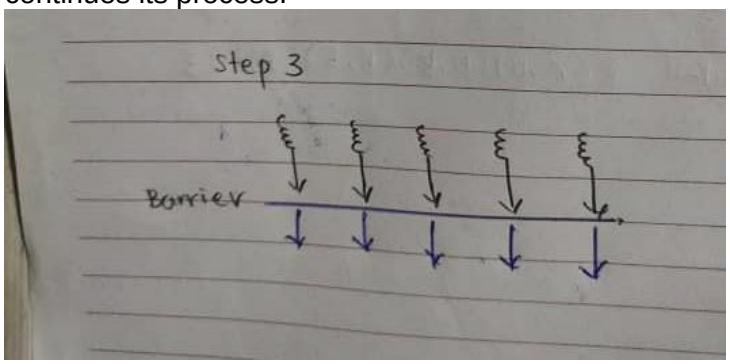
Step 1 : Demonstrates the five threads that will be used to reach the barrier.



Step 2 : Show the threads in order that they will reach the barrier, and each thread must wait for all of the others to reach the barrier.



Step 3 : After all of the threads have reached the barrier, show how the thread continues its process.



b) Mutex locks are used to implement critical segments in threads. There are two of them.Locked and unlocked. At any point of time, only one thread can lock a mutex lock. The simplest way to accomplish mutual exclusion on is to silence interrupts during a process's critical section. Any interrupt service routines will not be able to run as a result of this. Next mechanism is busy-wait. In this mechanism, mutual exclusion is achieved by the use of shared memory and an atomic test-and-set instruction. A process can test-and-set on a shared memory location, and because the operation is atomic, only one process at a time can set the flag. Any process that fails to set the flag can either move on to other tasks and try again later, release the processor to another process and try again later, or loop while checking the flag until it succeeds. Because preemption is still available, this strategy allows the system to keep working even if a process crashes while holding the lock.

QUESTION 4 (20 MARKS)

a) Speed up : S = Ts/Tp

Ts = 800
Tp = (150+ 15 + 5) + (170+25+5)+ (50+5+20)+ (80+10+20)+ (100+5+20)
= 680

S = 800/680
= 1.176

Total parallel overhead (*To*) : T_{all} = pTp
T_0 = pTp – Ts

T_0 = (5*800) – 680
= 3320 seconds

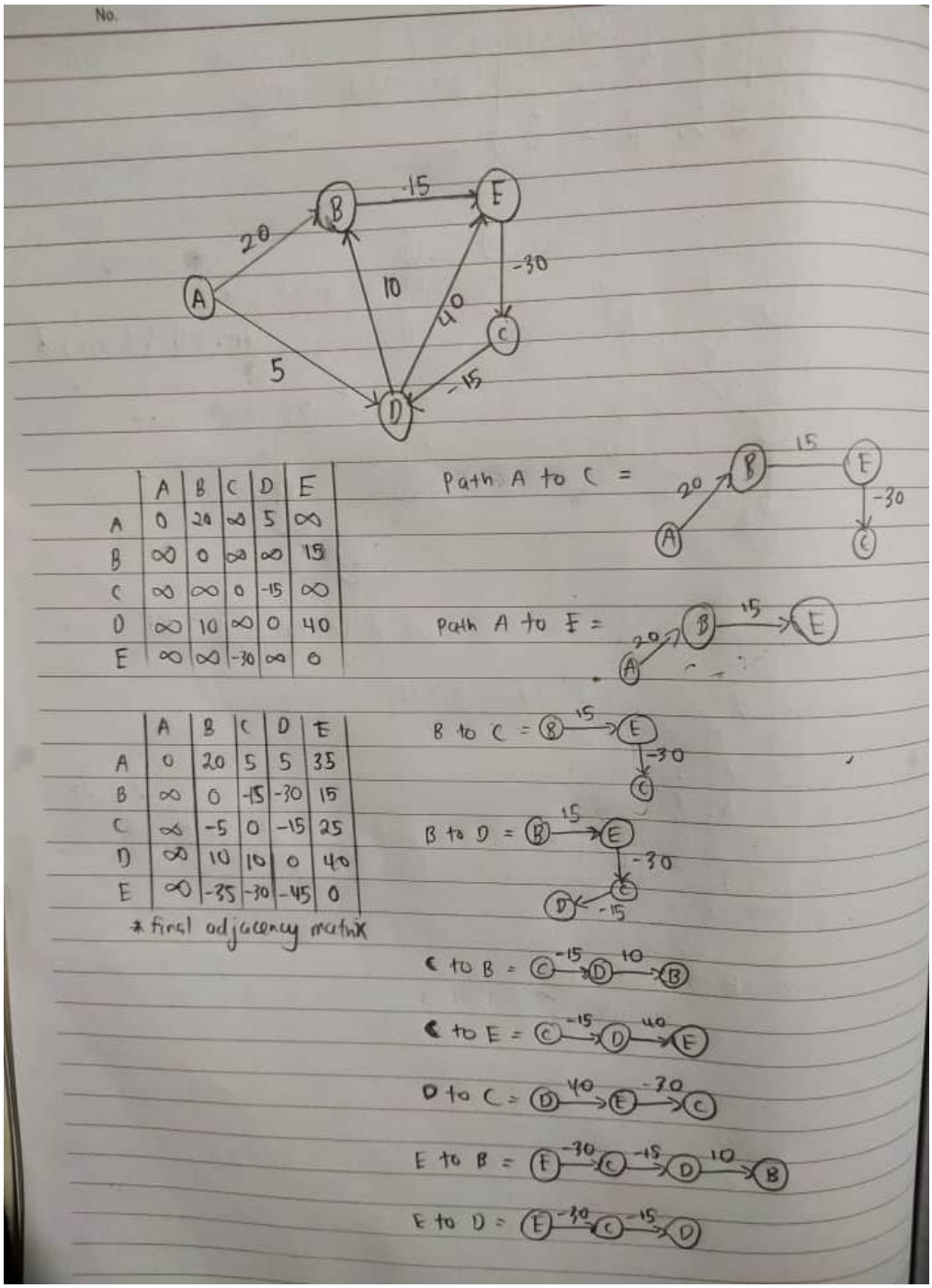
b) Message passing can be synchronous or asynchronous, also known as blocking or nonblocking.

1. Blocking send : The sending process is halted until the receiving process receives the message.
2. Nonblocking send : The sending procedure sends the message and then returns the system to normal functioning.
3. Blocking receive : The receiver waits for a message to arrive before proceeding.
4. Nonblocking receive : Either a legitimate message or a null message is returned to the receiver.

c)

QUESTION 5 (20 MARKS)

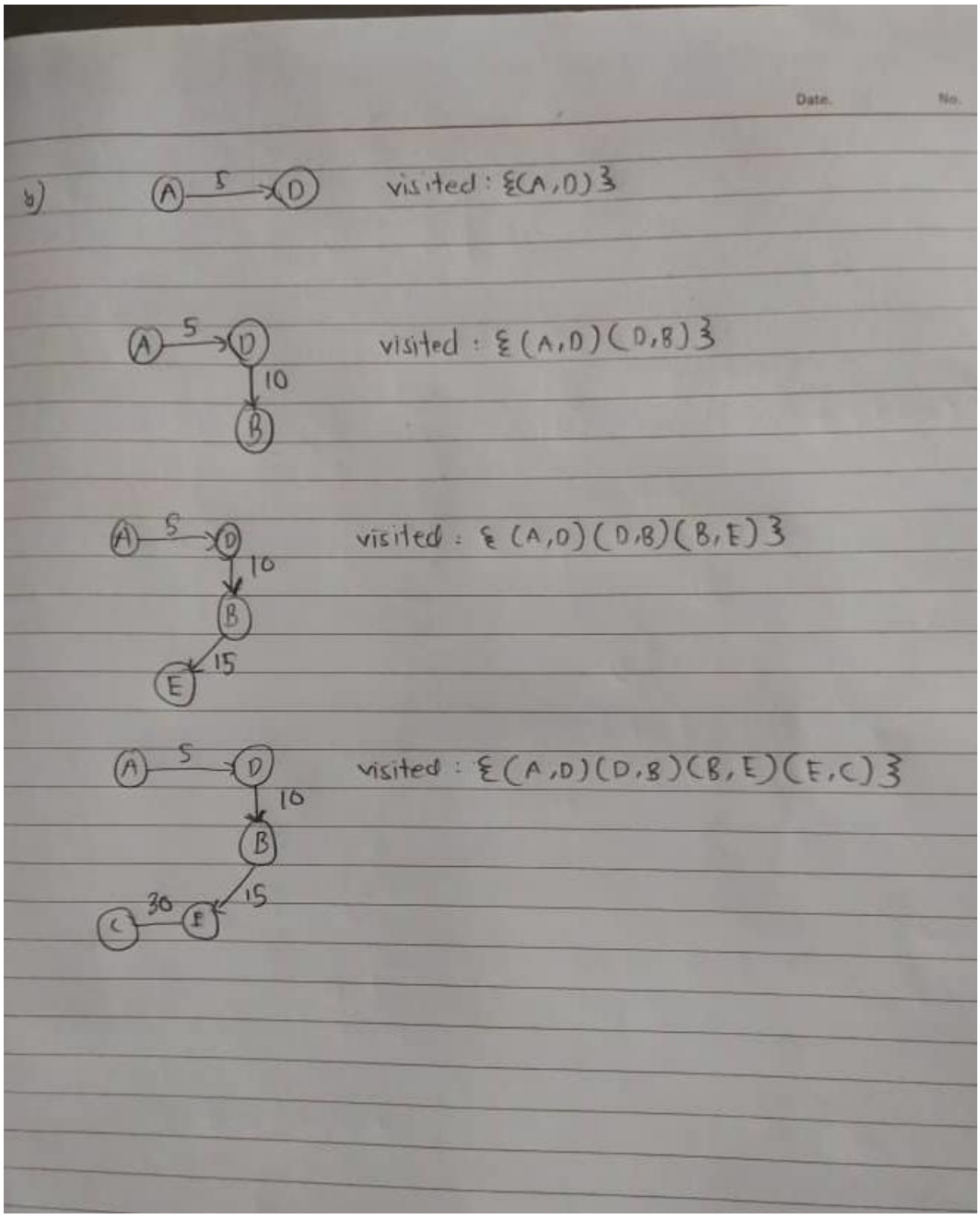
a) The suitable parallel graph algorithm to be use is Floyd Algorithm.



	A	B	C	D	E
A	0	20	∞	5	∞
B	∞	0	∞	∞	15
C	∞	∞	0	-15	∞
D	∞	10	∞	0	40
E	∞	∞	-30	∞	0

	A	B	C	D	E
A	0	20	5	5	35
B	∞	0	-15	-30	15
C	∞	-5	0	-15	25
D	∞	10	10	0	40
E	∞	-35	-30	-45	0

b)


Date.
No.
b)
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