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.

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.   Please scan and save ALL your answers as a SINGLE pdf file.

5.   Answer ALL questions in English.

QUESTION 1

a) Parallel processing improves the performance of computer applications. Describe with an example how these computing criteria benefit parallel architectures and programming models.

Criteria	Description
Software portability	
Variety of available methods of communication	
Immediate or real-time response	

(9 marks)

b) Describe the different types of programming models and the importance of programming models in shared-address space architecture.

(8 marks)

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

(8 marks)

QUESTION 2

a) Discuss the THREE (3) factors to be considered when designing parallel programs.

(6 marks)

b) Define thread and differentiate between the thread functions: Join, Suspend, and Interrupt.

(8 marks)

c) Describe with an example TWO (2) advantages of using collective communication about the performance of parallel processes.

(6 marks)

QUESTION 3

a) Discuss with an example the advantage of *barriers* on multi-thread programming. Draw an appropriate diagram showing executions of five threads with a barrier mechanism to support your answer.

(7 marks)

b) Define a critical segment and describe the TWO (2) mechanisms to ensure mutual exclusion to the critical section on shared memory organization.

(8 marks)

QUESTION 4

a) Assume the following Table 1. Describe the profiles of a computing application running as 5 processes. Assume the serial execution time for the application is 800 seconds. Discuss the impact of speedup and total parallel overhead for the application.

Process	Total computation time (s)	Total Interprocess communication time (s)	Idling (s)
1	150	15	5
2	170	25	5
3	50	5	20
4	80	10	20
5	100	5	20

Table 1.

(5 marks)

b) Explain the available methods and modes in the message passing mechanism for parallel programs.

(6 marks)

c) Discuss the use of a buffer to support the message passing mechanism for data transfer between two nodes through the interconnection network. Include in your discussion the protocols to be followed by each P01 and P02 processor and the issue that needs to be resolved by each processor.

(9 marks)

QUESTION 5

Assume the following table of one-way interactions between two computing nodes in an institution.

Start	Destination	Distance (m)
A	B	20
D	E	40
C	D	- 15
B	E	15
D	B	10
E	C	- 30
A	D	5

Table 2.

a) Perform a suitable parallel graph algorithm to find all the shortest paths between any two nodes in Table 2. Describe each phase required to complete the algorithm.

(12 marks)

b) Assume that the interaction between nodes in Table 2. can be presented as a minimum spanning tree. Transform the distances into positive weight and construct the spanning tree using the Kruskal algorithm. Describe each phase required to complete the algorithm.

(8 marks)

END OF QUESTION PAPER