Operating Systems
Lab-5: Implementing Heterogeneous Earliest Finishing Time (HEFT)

Implement the paper "**Performance-effective and low-complexity task scheduling for heterogeneous computing**" by **Topcuoglu** et al.

Input

Input will be taken from a file named "input.txt". The sample input file is attached to this post. The meanings of various lines in the input file are explained as hashed comments in the following lines

10 *#Number of tasks*

3 *#Number of processors*

14 13 11 13 12 13 7 5 18 21 *#Execution times of tasks on first processor*

16 19 13 8 13 16 15 11 12 7 *#Execution times of tasks on second processor*

9 18 19 17 10 9 11 14 20 16 *#Execution times of tasks on third processor*

#The number of above lines representing execution times (3 in this case) will change based on the number of processors. The number of integers in each line (10 in this case) will change according to the number of tasks.

#The following lines represent the adjacency matrix of the DAG which stores communication costs between various tasks.

0 18 12 9 11 14 0 0 0 0

0 0 0 0 0 0 0 19 16 0

0 0 0 0 0 0 23 0 0 0

0 0 0 0 0 0 27 23 0

0 0 0 0 0 0 0 13 0

0 0 0 0 0 0 15 0 0

0 0 0 0 0 0 0 0 17

0 0 0 0 0 0 0 0 11

0 0 0 0 0 0 0 0 13

0 0 0 0 0 0 0 0 0

Sample output:

No. of tasks:10
No. of processors:3

The upward rank values:
Task 1: 108.000000
Task 2: 77.000000
Task 3: 80.000008
Task 4: 80.000000
Task 5: 69.000000
Task 6: 63.333336
Task 7: 42.666668
Task 8: 35.666668
Task 9: 44.333336
Task 10: 14.666667

The order of tasks to be scheduled:
1 3 4 2 5 6 9 7 8 10

EST and EFT on different processors
Task: 1
processor 1||est: 0 eft: 14 ||
processor 2||est: 0 eft: 16 ||
processor 3||est: 0 eft: 9 ||

Task: 2
processor 1||est: 27 eft: 40 ||
processor 2||est: 27 eft: 46 ||
processor 3||est: 28 eft: 46 ||

Task: 3
processor 1||est: 21 eft: 32 ||
processor 2||est: 21 eft: 34 ||
processor 3||est: 9 eft: 28 ||

Task: 4
processor 1||est: 18 eft: 31 ||
processor 2||est: 18 eft: 26 ||
processor 3||est: 28 eft: 45 ||

Task: 5
processor 1||est: 40 eft: 52 ||
processor 2||est: 26 eft: 39 ||
processor 3||est: 28 eft: 38 ||

Task: 6
processor 1||est: 40 eft: 53 ||
processor 2||est: 26 eft: 42 ||
processor 3||est: 38 eft: 47 ||

Task: 7
processor 1||est: 51 eft: 58 ||
processor 2||est: 68 eft: 83 ||
processor 3||est: 38 eft: 49 ||

Task: 8
processor 1||est: 57 eft: 62 ||
processor 2||est: 68 eft: 79 ||
processor 3||est: 59 eft: 73 ||

Task: 9
processor 1||est: 51 eft: 69 ||
processor 2||est: 56 eft: 68 ||
processor 3||est: 56 eft: 76 ||

Task: 10
processor 1||est: 81 eft: 102 ||
processor 2||est: 73 eft: 80 ||
processor 3||est: 81 eft: 97 ||

Final Schedule:
Task 1 is executed on processor 3 from time 0 to 9
Task 2 is executed on processor 1 from time 27 to 40
Task 3 is executed on processor 3 from time 9 to 28
Task 4 is executed on processor 2 from time 18 to 26
Task 5 is executed on processor 3 from time 28 to 38
Task 6 is executed on processor 2 from time 26 to 42
Task 7 is executed on processor 3 from time 38 to 49
Task 8 is executed on processor 1 from time 57 to 62
Task 9 is executed on processor 2 from time 56 to 68
Task 10 is executed on processor 2 from time 73 to 80

Hence, the makespan length from the schedule: 80

Turn-in:
Exactly one of the team members should electronically turn in a zip containing a folder. The folder should contain your source file as well as a readme.txt file. README file should describe the names of your executables, the compiling instructions, or anything else special you want to let us know. It should also contain the names of all the contributors to the code. The README file should be in **plain text** format.
The name of the zip, the folder zipped as well as the source code file should be the roll numbers of the team members separated with underscores.

Deadline:
The deadline to complete this assignment is Oct 24, Sunday midnight.

Late turn-in policy:
Late turn-ins will be accepted for up to one day with a 50% penalty.