Task scheduling Algorithm

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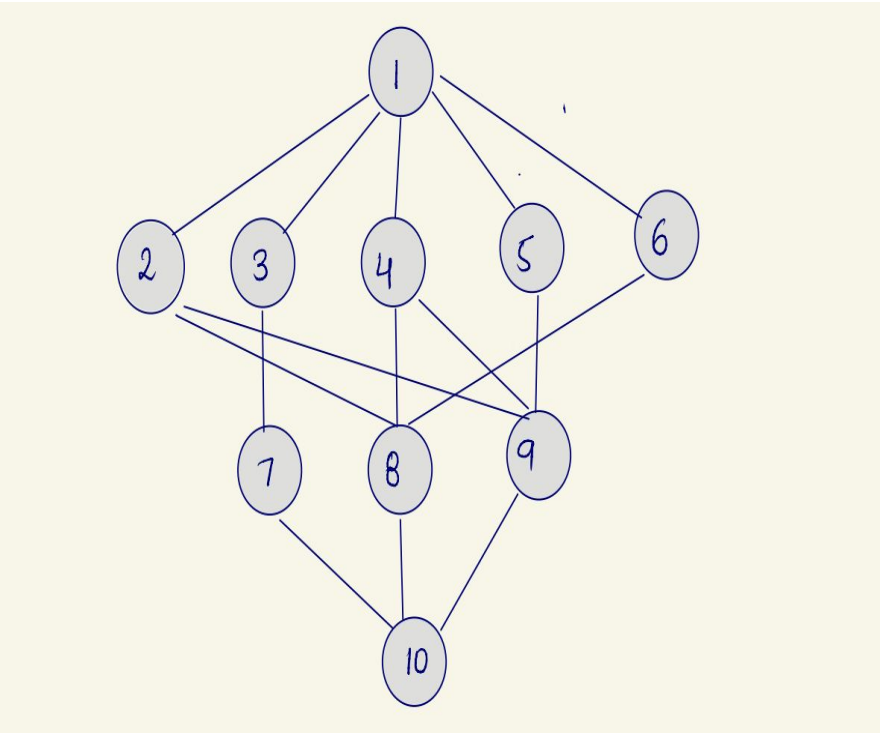
Example 1

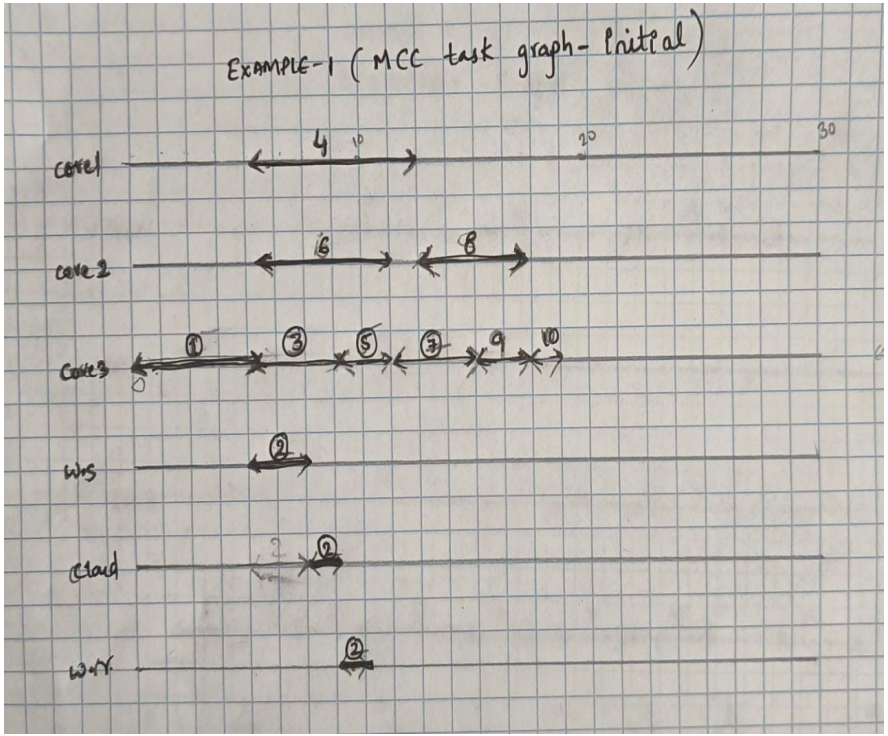


Task no	core 1	core 2	core 3
1	9	7	5
2	8	6	5
3	6	5	4
4	7	5	3
5	5	4	2
6	7	6	4
7	8	5	3
8	6	4	2
9	5	3	2
10	7	4	2

Example 1 - Initial Scheduling Algorithm

```
task - 1 is assigned on 3 node
local_compute      ready time :: 0   :: start time :: 0   :: finish_time   :: 5
 ================================================================================
task - 2 is assigned on cloud
wireless_send      ready time :: 5   :: start time :: 5   :: finish_time   :: 8
cloud_compute      ready time :: 8   :: start time :: 8   :: finish_time   :: 9
wireless_receive   ready time :: 9   :: start time :: 9   :: finish_time   :: 10
 ================================================================================
task - 3 is assigned on 3 node
local_compute      ready time :: 5   :: start time :: 5   :: finish_time   :: 9
 ================================================================================
task - 4 is assigned on 1 node
local_compute      ready time :: 5   :: start time :: 5   :: finish_time   :: 12
 ================================================================================
task - 5 is assigned on 3 node
local_compute      ready time :: 5   :: start time :: 9   :: finish_time   :: 11
 ================================================================================
task - 6 is assigned on 2 node
local_compute      ready time :: 5   :: start time :: 5   :: finish_time   :: 11
 ================================================================================
task - 7 is assigned on 3 node
local_compute      ready time :: 9   :: start time :: 11   :: finish_time   :: 14
 ================================================================================
task - 8 is assigned on 2 node
local_compute      ready time :: 12   :: start time :: 12   :: finish_time   :: 16
 ================================================================================
task - 9 is assigned on 3 node
local_compute      ready time :: 12   :: start time :: 14   :: finish_time   :: 16
 ================================================================================
task - 10 is assigned on 3 node
local_compute      ready time :: 16   :: start time :: 16   :: finish_time   :: 18
 ================================================================================
================================================================================
```

Example 1 MCC task graph - Initial



Graph - same as paper :

By calculating energy we get

E1 =7

E2 =20

E3 =72

EC=1.5

E-Total= 100.5

T = 18

Paper - initial scheduling task graphs VS my solution:

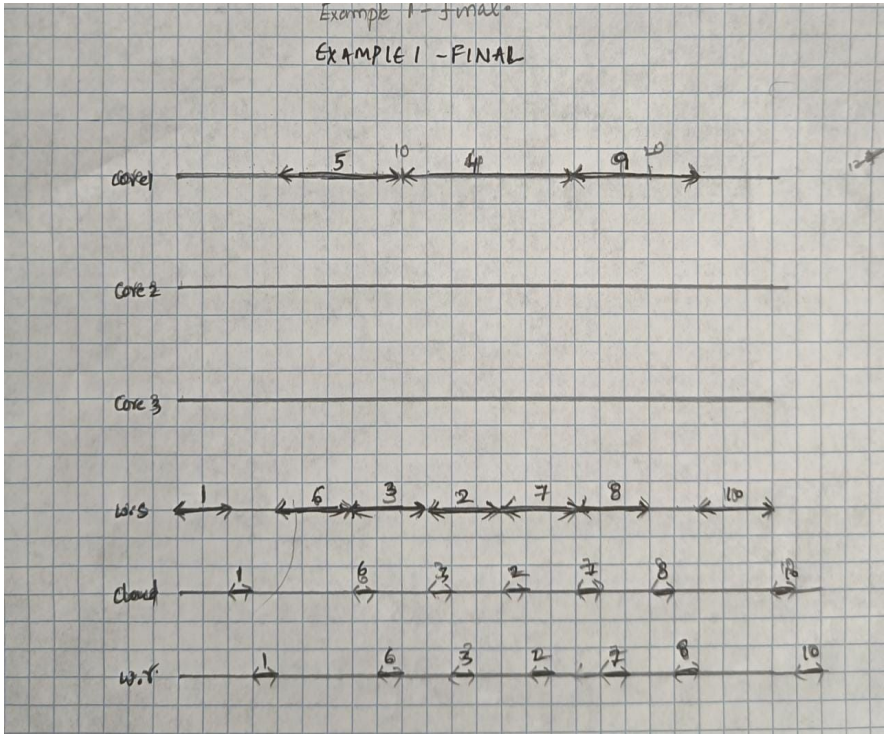
It can be clearly observed that task graph mentioned in the paper and generated by the code is **same.**

I have made an assumption that entry and exit tasks always take place on the core instead of cloud.

Example 1 - Final Scheduling Algorithm

```
task - 1 is assigned on cloud
wireless_send      ready time :: 0  :: start time :: 0  :: finish_time  :: 3
cloud_compute      ready time :: 3  :: start time :: 3  :: finish_time  :: 4
wireless_receive   ready time :: 4  :: start time :: 4  :: finish_time  :: 5
 ================================================================================
task - 2 is assigned on cloud
wireless_send      ready time :: 5  :: start time :: 11  :: finish_time  :: 14
cloud_compute      ready time :: 14  :: start time :: 14  :: finish_time  :: 15
wireless_receive   ready time :: 15  :: start time :: 15  :: finish_time  :: 16
 ================================================================================
task - 3 is assigned on cloud
wireless_send      ready time :: 5  :: start time :: 8  :: finish_time  :: 11
cloud_compute      ready time :: 11  :: start time :: 11  :: finish_time  :: 12
wireless_receive   ready time :: 12  :: start time :: 12  :: finish_time  :: 13
 ================================================================================
task - 4 is assigned on 1 node
local_compute      ready time :: 5  :: start time :: 10  :: finish_time  :: 17
 ================================================================================
task - 5 is assigned on 1 node
local_compute      ready time :: 5  :: start time :: 5  :: finish_time  :: 10
 ================================================================================
task - 6 is assigned on cloud
wireless_send      ready time :: 5  :: start time :: 5  :: finish_time  :: 8
cloud_compute      ready time :: 8  :: start time :: 8  :: finish_time  :: 9
wireless_receive   ready time :: 9  :: start time :: 9  :: finish_time  :: 10
 ================================================================================
task - 7 is assigned on cloud
wireless_send      ready time :: 11  :: start time :: 14  :: finish_time  :: 17
cloud_compute      ready time :: 17  :: start time :: 17  :: finish_time  :: 18
wireless_receive   ready time :: 18  :: start time :: 18  :: finish_time  :: 19
 ================================================================================
task - 8 is assigned on cloud
wireless_send      ready time :: 17  :: start time :: 17  :: finish_time  :: 20
cloud_compute      ready time :: 20  :: start time :: 20  :: finish_time  :: 21
wireless_receive   ready time :: 21  :: start time :: 21  :: finish_time  :: 22
 ================================================================================
task - 9 is assigned on 1 node
local_compute      ready time :: 17  :: start time :: 17  :: finish_time  :: 22
 ================================================================================
task - 10 is assigned on cloud
wireless_send      ready time :: 22  :: start time :: 22  :: finish_time  :: 25
cloud_compute      ready time :: 25  :: start time :: 25  :: finish_time  :: 26
```

Example 1 MCC task graph - Final



Graph - same as paper :

By calculating energy we get

E1 = 17

E2 = 0

E3 = 0

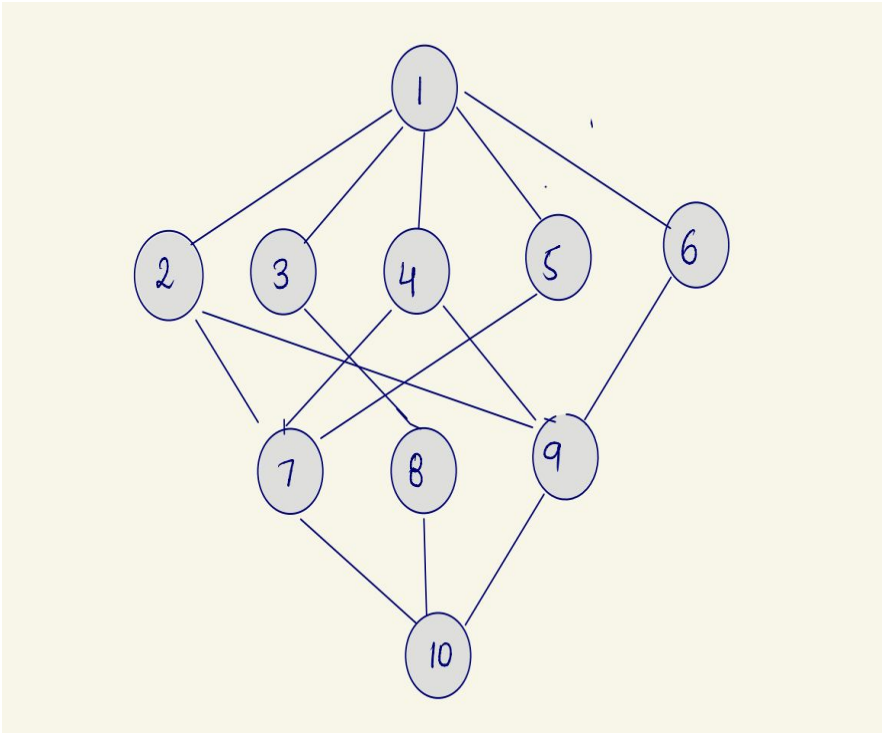
EC= 10.5

E-Total= 27.5

T = 27

Observation::

Example 2

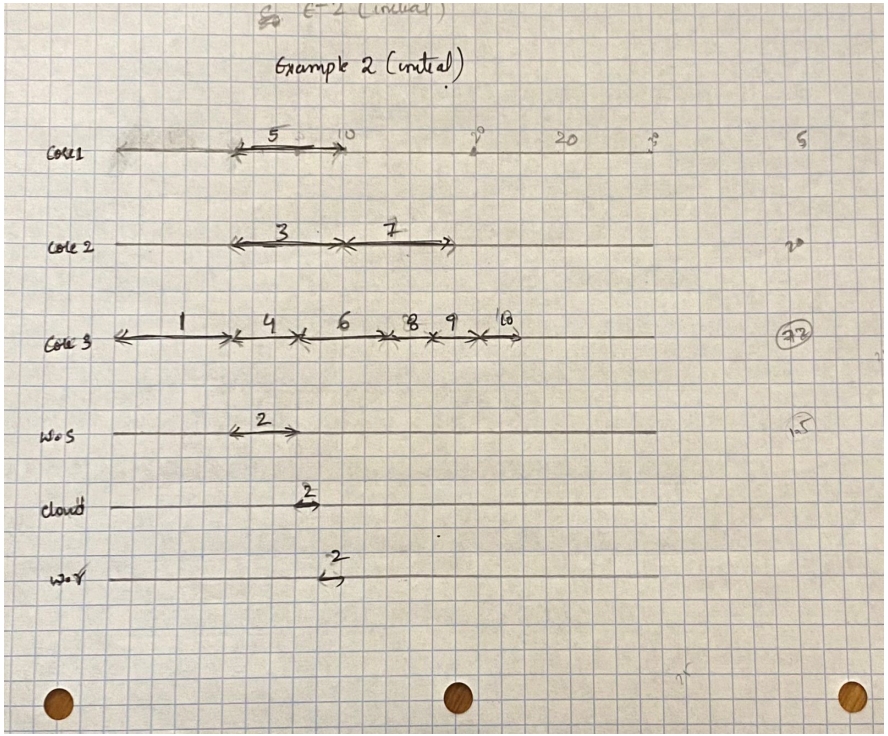


Task no	core 1	core 2	core 3
1	9	7	5
2	8	6	5
3	6	5	4
4	7	5	3
5	5	4	2
6	7	6	4
7	8	5	3
8	6	4	2
9	5	3	2
10	7	4	2

Example 2 - Initial Scheduling Algorithm

```
task - 1 is assigned on 3 node
local_compute      ready time :: 0  :: start time :: 0  :: finish_time  :: 5
 ================================================================================
task - 2 is assigned on cloud
wireless_send      ready time :: 5  :: start time :: 5  :: finish_time  :: 8
cloud_compute      ready time :: 8  :: start time :: 8  :: finish_time  :: 9
wireless_receive   ready time :: 9  :: start time :: 9  :: finish_time  :: 10
 ================================================================================
task - 3 is assigned on 2 node
local_compute      ready time :: 5  :: start time :: 5  :: finish_time  :: 10
 ================================================================================
task - 4 is assigned on 3 node
local_compute      ready time :: 5  :: start time :: 5  :: finish_time  :: 8
 ================================================================================
task - 5 is assigned on 1 node
local_compute      ready time :: 5  :: start time :: 5  :: finish_time  :: 10
 ================================================================================
task - 6 is assigned on 3 node
local_compute      ready time :: 5  :: start time :: 8  :: finish_time  :: 12
 ================================================================================
task - 7 is assigned on 2 node
local_compute      ready time :: 10  :: start time :: 10  :: finish_time  :: 15
 ================================================================================
task - 8 is assigned on 3 node
local_compute      ready time :: 10  :: start time :: 12  :: finish_time  :: 14
 ================================================================================
task - 9 is assigned on 3 node
local_compute      ready time :: 12  :: start time :: 14  :: finish_time  :: 16
 ================================================================================
task - 10 is assigned on 3 node
local_compute      ready time :: 16  :: start time :: 16  :: finish_time  :: 18
 ================================================================================
================================================================================
```

Example 2 MCC task graph - Initial



Graph - same as paper - with dependency changes

By calculating energy we get

E1 =5

E2 =20

E3 =72

EC=1.5

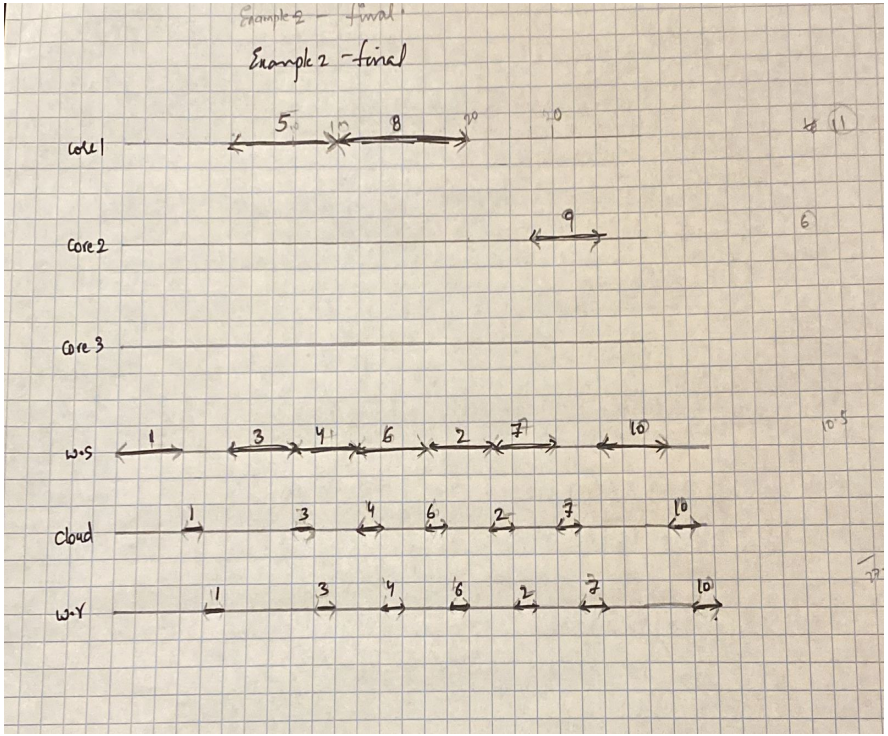
E-Total= 98.5

T = 18

Example 2 - Final Scheduling Algorithm

```
task - 1 is assigned on cloud
wireless_send      ready time :: 0  :: start time :: 0  :: finish_time  :: 3
cloud_compute      ready time :: 3  :: start time :: 3  :: finish_time  :: 4
wireless_receive   ready time :: 4  :: start time :: 4  :: finish_time  :: 5
 ================================================================================
task - 2 is assigned on cloud
wireless_send      ready time :: 5  :: start time :: 14  :: finish_time  :: 17
cloud_compute      ready time :: 17  :: start time :: 17  :: finish_time  :: 18
wireless_receive   ready time :: 18  :: start time :: 18  :: finish_time  :: 19
 ================================================================================
task - 3 is assigned on cloud
wireless_send      ready time :: 5  :: start time :: 5  :: finish_time  :: 8
cloud_compute      ready time :: 8  :: start time :: 8  :: finish_time  :: 9
wireless_receive   ready time :: 9  :: start time :: 9  :: finish_time  :: 10
 ================================================================================
task - 4 is assigned on cloud
wireless_send      ready time :: 5  :: start time :: 8  :: finish_time  :: 11
cloud_compute      ready time :: 11  :: start time :: 11  :: finish_time  :: 12
wireless_receive   ready time :: 12  :: start time :: 12  :: finish_time  :: 13
 ================================================================================
task - 5 is assigned on 1 node
local_compute      ready time :: 5  :: start time :: 5  :: finish_time  :: 10
 ================================================================================
task - 6 is assigned on cloud
wireless_send      ready time :: 5  :: start time :: 11  :: finish_time  :: 14
cloud_compute      ready time :: 14  :: start time :: 14  :: finish_time  :: 15
wireless_receive   ready time :: 15  :: start time :: 15  :: finish_time  :: 16
 ================================================================================
task - 7 is assigned on cloud
wireless_send      ready time :: 17  :: start time :: 17  :: finish_time  :: 20
cloud_compute      ready time :: 20  :: start time :: 20  :: finish_time  :: 21
wireless_receive   ready time :: 21  :: start time :: 21  :: finish_time  :: 22
 ================================================================================
task - 8 is assigned on 1 node
local_compute      ready time :: 10  :: start time :: 10  :: finish_time  :: 16
 ================================================================================
task - 9 is assigned on 2 node
local_compute      ready time :: 19  :: start time :: 19  :: finish_time  :: 22
 ================================================================================
task - 10 is assigned on cloud
wireless_send      ready time :: 22  :: start time :: 22  :: finish_time  :: 25
cloud_compute      ready time :: 25  :: start time :: 25  :: finish_time  :: 26
wireless_receive   ready time :: 26  :: start time :: 26  :: finish_time  :: 27
 ================================================================================
```

Example 2 MCC task graph - Final



Graph - same as paper - with dependency changes

By calculating energy we get

E1 = 11

E2 = 6

E3 = 0

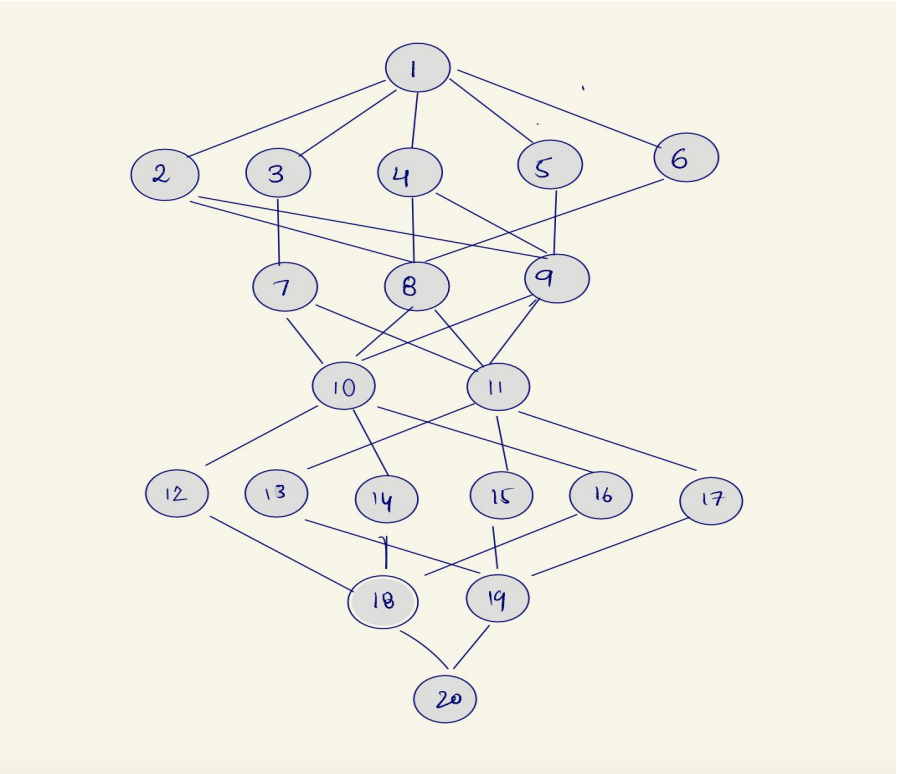
EC= 10.5

E-Total= 27.5

T = 27

Observation::

Example 3

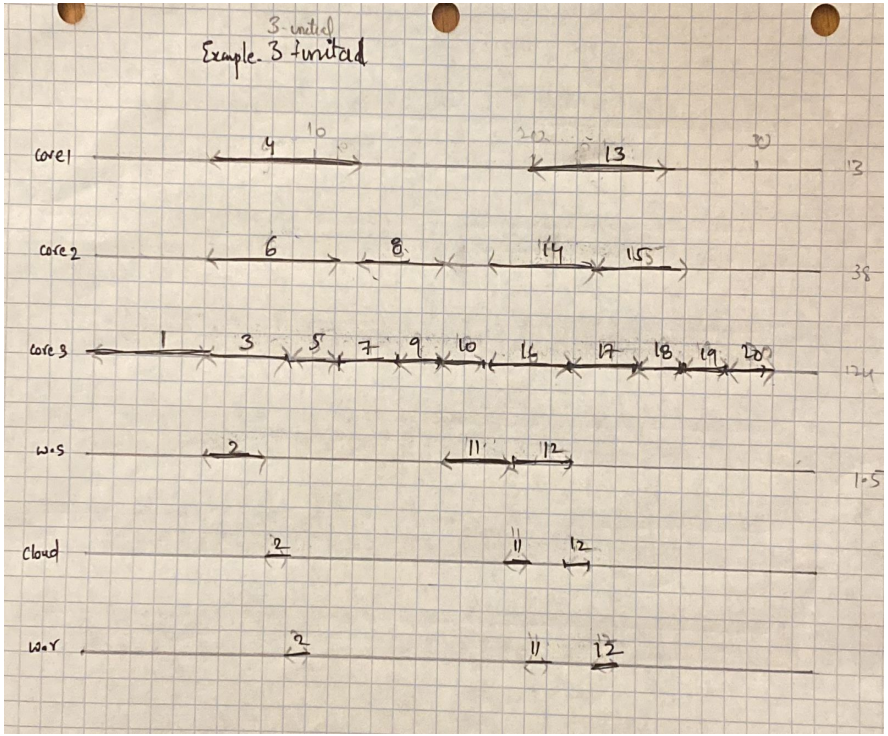


Task no	core 1	core 2	core 3
1	9	7	5
2	8	6	5
3	6	5	4
4	7	5	3
5	5	4	2
6	7	6	4
7	8	5	3
8	6	4	2
9	5	3	2
10	7	4	2
11	9	7	5
12	8	6	5
13	6	5	4
14	7	5	3
15	5	4	2
16	7	6	4
17	8	5	3
18	6	4	2
19	5	3	2
20	7	4	2

Example 3 - Initial Scheduling Algorithm

```
task - 1 is assigned on 3 node :: local_compute     ready time :: 0  :: start time :: 0  :: finish_time  :: 5
 ========================================================================
task - 2 is assigned on cloud :: wireless_send     ready time :: 5  :: start time :: 5  :: finish_time  :: 8
cloud_compute     ready time :: 8  :: start time :: 8  :: finish_time  :: 9
wireless_receive  ready time :: 9  :: start time :: 9  :: finish_time  :: 10
 ========================================================================
task - 3 is assigned on 3 node :: local_compute     ready time :: 5  :: start time :: 5  :: finish_time  :: 9
 ========================================================================
task - 4 is assigned on 1 node :: local_compute     ready time :: 5  :: start time :: 5  :: finish_time  :: 12
 ========================================================================
task - 5 is assigned on 3 node :: local_compute     ready time :: 5  :: start time :: 9  :: finish_time  :: 11
 ========================================================================
task - 6 is assigned on 2 node :: local_compute     ready time :: 5  :: start time :: 5  :: finish_time  :: 11
 ========================================================================
task - 7 is assigned on 3 node :: local_compute     ready time :: 9  :: start time :: 11  :: finish_time  :: 14
 ========================================================================
task - 8 is assigned on 2 node :: local_compute     ready time :: 12  :: start time :: 12  :: finish_time  :: 16
 ========================================================================
task - 9 is assigned on 3 node :: local_compute     ready time :: 12  :: start time :: 14  :: finish_time  :: 16
 ========================================================================
task - 10 is assigned on 3 node :: local_compute     ready time :: 16  :: start time :: 16  :: finish_time  :: 18
 ========================================================================
task - 11 is assigned on cloud :: wireless_send     ready time :: 16  :: start time :: 16  :: finish_time  :: 19
cloud_compute     ready time :: 19  :: start time :: 19  :: finish_time  :: 20
wireless_receive  ready time :: 20  :: start time :: 20  :: finish_time  :: 21
 ========================================================================
task - 12 is assigned on cloud :: wireless_send     ready time :: 18  :: start time :: 19  :: finish_time  :: 22
cloud_compute     ready time :: 22  :: start time :: 22  :: finish_time  :: 23
wireless_receive  ready time :: 23  :: start time :: 23  :: finish_time  :: 24
 ========================================================================
task - 13 is assigned on 1 node :: local_compute     ready time :: 21  :: start time :: 21  :: finish_time  :: 27
 ========================================================================
task - 14 is assigned on 2 node :: local_compute     ready time :: 18  :: start time :: 18  :: finish_time  :: 23
 ========================================================================
task - 15 is assigned on 2 node :: local_compute     ready time :: 21  :: start time :: 23  :: finish_time  :: 27
 ========================================================================
task - 16 is assigned on 3 node :: local_compute     ready time :: 18  :: start time :: 18  :: finish_time  :: 22
 ========================================================================
task - 17 is assigned on 3 node :: local_compute     ready time :: 21  :: start time :: 22  :: finish_time  :: 25
 ========================================================================
task - 18 is assigned on 3 node :: local_compute     ready time :: 23  :: start time :: 25  :: finish_time  :: 27
 ========================================================================
task - 19 is assigned on 3 node :: local_compute     ready time :: 27  :: start time :: 27  :: finish_time  :: 29
 ========================================================================
task - 20 is assigned on 3 node :: local_compute     ready time :: 29  :: start time :: 29  :: finish_time  :: 31
 ========================================================================
```

Example 3 MCC task graph - Initial



Graph - with 20 nodes

By calculating energy we get

E1 = 13

E2 = 38

E3 = 124

EC= 4.5

E-Total= 179.5

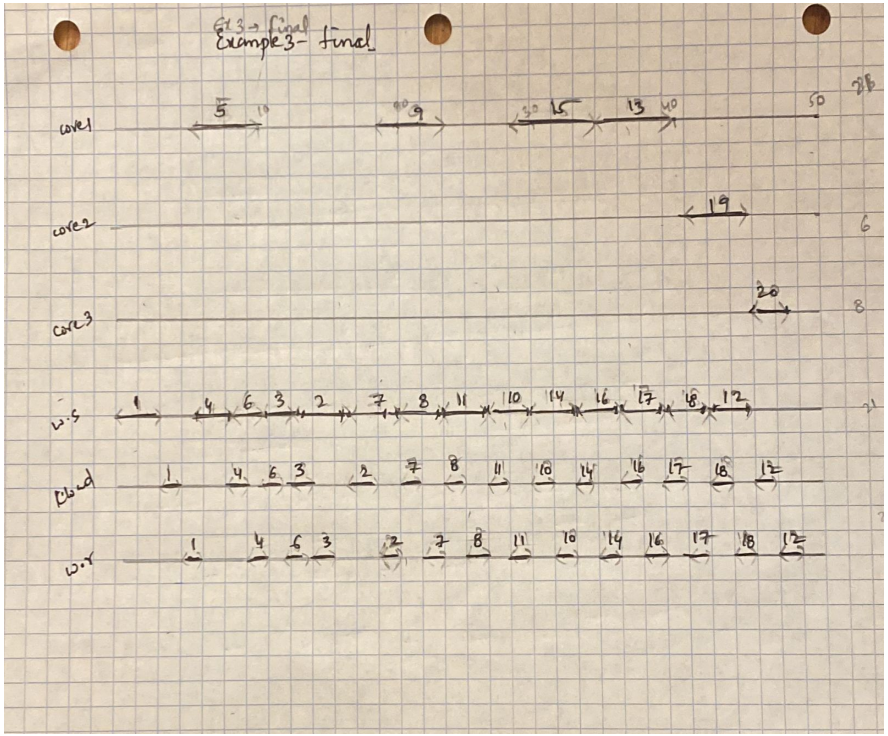
T = 31

Details: 20 nodes

Example 3 - Final Scheduling Algorithm

```
task - 1 is assigned on cloud :: wireless_send     ready time :: 0  :: start time :: 0  :: finish_time  :: 3
cloud_compute      ready time :: 3  :: start time :: 3  :: finish_time  :: 4
wireless_receive   ready time :: 4  :: start time :: 4  :: finish_time  :: 5
 ========================================================================
task - 2 is assigned on cloud :: wireless_send     ready time :: 5  :: start time :: 14  :: finish_time  :: 17
cloud_compute      ready time :: 17  :: start time :: 17  :: finish_time  :: 18
wireless_receive   ready time :: 18  :: start time :: 18  :: finish_time  :: 19
 ========================================================================
task - 3 is assigned on cloud :: wireless_send     ready time :: 5  :: start time :: 11  :: finish_time  :: 14
cloud_compute      ready time :: 14  :: start time :: 14  :: finish_time  :: 15
wireless_receive   ready time :: 15  :: start time :: 15  :: finish_time  :: 16
 ========================================================================
task - 4 is assigned on cloud :: wireless_send     ready time :: 5  :: start time :: 5  :: finish_time  :: 8
cloud_compute      ready time :: 8  :: start time :: 8  :: finish_time  :: 9
wireless_receive   ready time :: 9  :: start time :: 9  :: finish_time  :: 10
 ========================================================================
task - 5 is assigned on 1 node :: local_compute      ready time :: 5  :: start time :: 5  :: finish_time  :: 10
 ========================================================================
task - 6 is assigned on cloud :: wireless_send     ready time :: 5  :: start time :: 8  :: finish_time  :: 11
cloud_compute      ready time :: 11  :: start time :: 11  :: finish_time  :: 12
wireless_receive   ready time :: 12  :: start time :: 12  :: finish_time  :: 13
 ========================================================================
task - 7 is assigned on cloud :: wireless_send     ready time :: 14  :: start time :: 17  :: finish_time  :: 20
cloud_compute      ready time :: 20  :: start time :: 20  :: finish_time  :: 21
wireless_receive   ready time :: 21  :: start time :: 21  :: finish_time  :: 22
 ========================================================================
task - 8 is assigned on cloud :: wireless_send     ready time :: 17  :: start time :: 20  :: finish_time  :: 23
cloud_compute      ready time :: 23  :: start time :: 23  :: finish_time  :: 24
wireless_receive   ready time :: 24  :: start time :: 24  :: finish_time  :: 25
 ========================================================================
task - 9 is assigned on 1 node :: local_compute      ready time :: 19  :: start time :: 19  :: finish_time  :: 24
 ========================================================================
task - 10 is assigned on cloud :: wireless_send     ready time :: 24  :: start time :: 27  :: finish_time  :: 30
cloud_compute      ready time :: 30  :: start time :: 30  :: finish_time  :: 31
wireless_receive   ready time :: 31  :: start time :: 31  :: finish_time  :: 32
 ========================================================================
task - 11 is assigned on cloud :: wireless_send     ready time :: 24  :: start time :: 24  :: finish_time  :: 27
cloud_compute      ready time :: 27  :: start time :: 27  :: finish_time  :: 28
wireless_receive   ready time :: 28  :: start time :: 28  :: finish_time  :: 29
 ========================================================================
task - 12 is assigned on cloud :: wireless_send     ready time :: 30  :: start time :: 42  :: finish_time  :: 45
cloud_compute      ready time :: 45  :: start time :: 45  :: finish_time  :: 46
wireless_receive   ready time :: 46  :: start time :: 46  :: finish_time  :: 47
 ========================================================================
task - 13 is assigned on 1 node :: local_compute      ready time :: 29  :: start time :: 34  :: finish_time  :: 40
 ========================================================================
task - 14 is assigned on cloud :: wireless_send     ready time :: 30  :: start time :: 30  :: finish_time  :: 33
cloud_compute      ready time :: 33  :: start time :: 33  :: finish_time  :: 34
wireless_receive   ready time :: 34  :: start time :: 34  :: finish_time  :: 35
 ========================================================================
task - 15 is assigned on 1 node :: local_compute      ready time :: 29  :: start time :: 29  :: finish_time  :: 34
 ========================================================================
task - 16 is assigned on cloud :: wireless_send     ready time :: 30  :: start time :: 33  :: finish_time  :: 36
cloud_compute      ready time :: 36  :: start time :: 36  :: finish_time  :: 37
wireless_receive   ready time :: 37  :: start time :: 37  :: finish_time  :: 38
 ========================================================================
task - 17 is assigned on cloud :: wireless_send     ready time :: 27  :: start time :: 36  :: finish_time  :: 39
cloud_compute      ready time :: 39  :: start time :: 39  :: finish_time  :: 40
wireless_receive   ready time :: 40  :: start time :: 40  :: finish_time  :: 41
 ========================================================================
task - 18 is assigned on cloud :: wireless_send     ready time :: 36  :: start time :: 39  :: finish_time  :: 42
cloud_compute      ready time :: 42  :: start time :: 42  :: finish_time  :: 43
wireless_receive   ready time :: 43  :: start time :: 43  :: finish_time  :: 44
 ========================================================================
task - 19 is assigned on 2 node :: local_compute      ready time :: 41  :: start time :: 41  :: finish_time  :: 44
 ========================================================================
task - 20 is assigned on 3 node :: local_compute      ready time :: 44  :: start time :: 44  :: finish_time  :: 46
 ========================================================================
```

Example 3 MCC task graph - Final



Graph - with 20 nodes

By calculating energy we get

E1 = 21

E2 = 6

E3 = 8

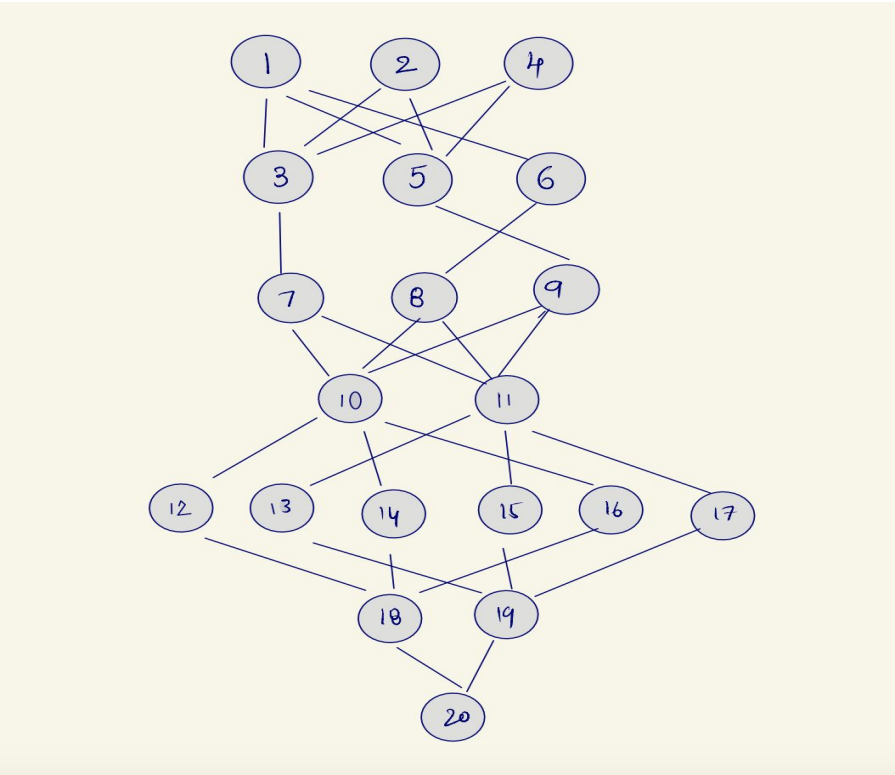
EC= 21

E-Total= 56

T = 46

Observation::

Example 4

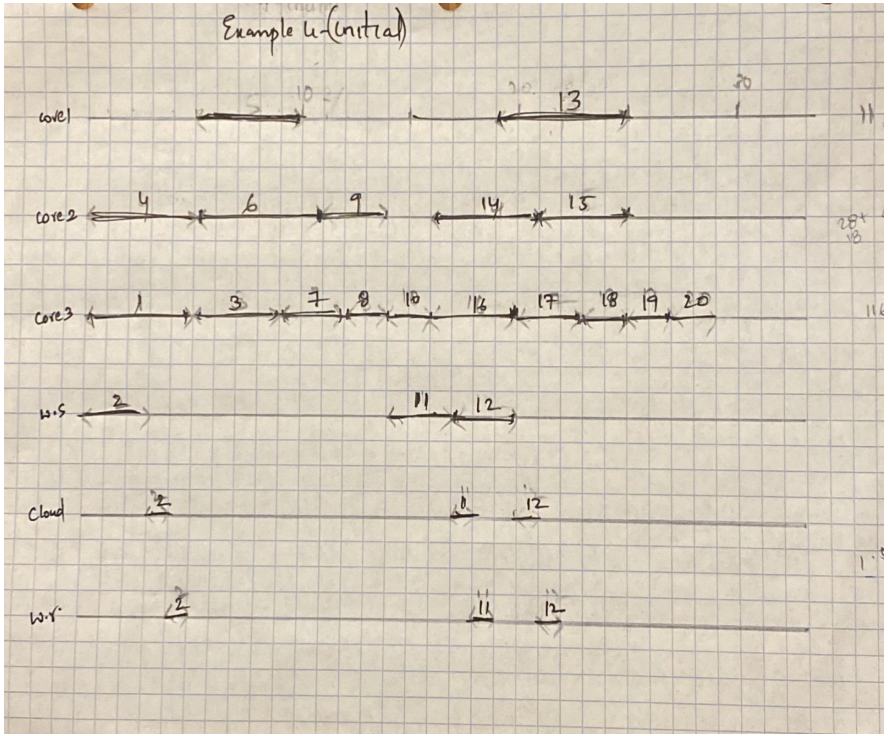


Task no	core 1	core 2	core 3
1	9	7	5
2	8	6	5
3	6	5	4
4	7	5	3
5	5	4	2
6	7	6	4
7	8	5	3
8	6	4	2
9	5	3	2
10	7	4	2
11	9	7	5
12	8	6	5
13	6	5	4
14	7	5	3
15	5	4	2
16	7	6	4
17	8	5	3
18	6	4	2
19	5	3	2
20	7	4	2

Example 4 - Initial Scheduling Algorithm

```
task – 1 is assigned on 3 node :: local_compute     ready time :: 0  :: start time :: 0  :: finish_time  :: 5
 ================================================================================
task – 2 is assigned on cloud :: wireless_send     ready time :: 0  :: start time :: 0  :: finish_time  :: 3
cloud_compute     ready time :: 3  :: start time :: 3  :: finish_time  :: 4
wireless_receive  ready time :: 4  :: start time :: 4  :: finish_time  :: 5
 ================================================================================
task – 3 is assigned on 3 node :: local_compute     ready time :: 5  :: start time :: 5  :: finish_time  :: 9
 ================================================================================
task – 4 is assigned on 2 node :: local_compute     ready time :: 0  :: start time :: 0  :: finish_time  :: 5
 ================================================================================
task – 5 is assigned on 1 node :: local_compute     ready time :: 5  :: start time :: 5  :: finish_time  :: 10
 ================================================================================
task – 6 is assigned on 2 node :: local_compute     ready time :: 5  :: start time :: 5  :: finish_time  :: 11
 ================================================================================
task – 7 is assigned on 3 node :: local_compute     ready time :: 9  :: start time :: 9  :: finish_time  :: 12
 ================================================================================
task – 8 is assigned on 3 node :: local_compute     ready time :: 11  :: start time :: 12  :: finish_time  :: 14
 ================================================================================
task – 9 is assigned on 2 node :: local_compute     ready time :: 10  :: start time :: 11  :: finish_time  :: 14
 ================================================================================
task – 10 is assigned on 3 node :: local_compute     ready time :: 14  :: start time :: 14  :: finish_time  :: 16
 ================================================================================
task – 11 is assigned on cloud :: wireless_send     ready time :: 14  :: start time :: 14  :: finish_time  :: 17
cloud_compute     ready time :: 17  :: start time :: 17  :: finish_time  :: 18
wireless_receive  ready time :: 18  :: start time :: 18  :: finish_time  :: 19
 ================================================================================
task – 12 is assigned on cloud :: wireless_send     ready time :: 16  :: start time :: 17  :: finish_time  :: 20
cloud_compute     ready time :: 20  :: start time :: 20  :: finish_time  :: 21
wireless_receive  ready time :: 21  :: start time :: 21  :: finish_time  :: 22
 ================================================================================
task – 13 is assigned on 1 node :: local_compute     ready time :: 19  :: start time :: 19  :: finish_time  :: 25
 ================================================================================
task – 14 is assigned on 2 node :: local_compute     ready time :: 16  :: start time :: 16  :: finish_time  :: 21
 ================================================================================
task – 15 is assigned on 2 node :: local_compute     ready time :: 19  :: start time :: 21  :: finish_time  :: 25
 ================================================================================
task – 16 is assigned on 3 node :: local_compute     ready time :: 16  :: start time :: 16  :: finish_time  :: 20
 ================================================================================
task – 17 is assigned on 3 node :: local_compute     ready time :: 19  :: start time :: 20  :: finish_time  :: 23
 ================================================================================
task – 18 is assigned on 3 node :: local_compute     ready time :: 21  :: start time :: 23  :: finish_time  :: 25
 ================================================================================
task – 19 is assigned on 3 node :: local_compute     ready time :: 25  :: start time :: 25  :: finish_time  :: 27
 ================================================================================
task – 20 is assigned on 3 node :: local_compute     ready time :: 27  :: start time :: 27  :: finish_time  :: 29
 ================================================================================
```

Example 4 MCC task graph - Initial



Graph - same as paper :

By calculating energy we get

E1 =11

E2 =46

E3 =116

EC=4.5

E-Total= 177.5

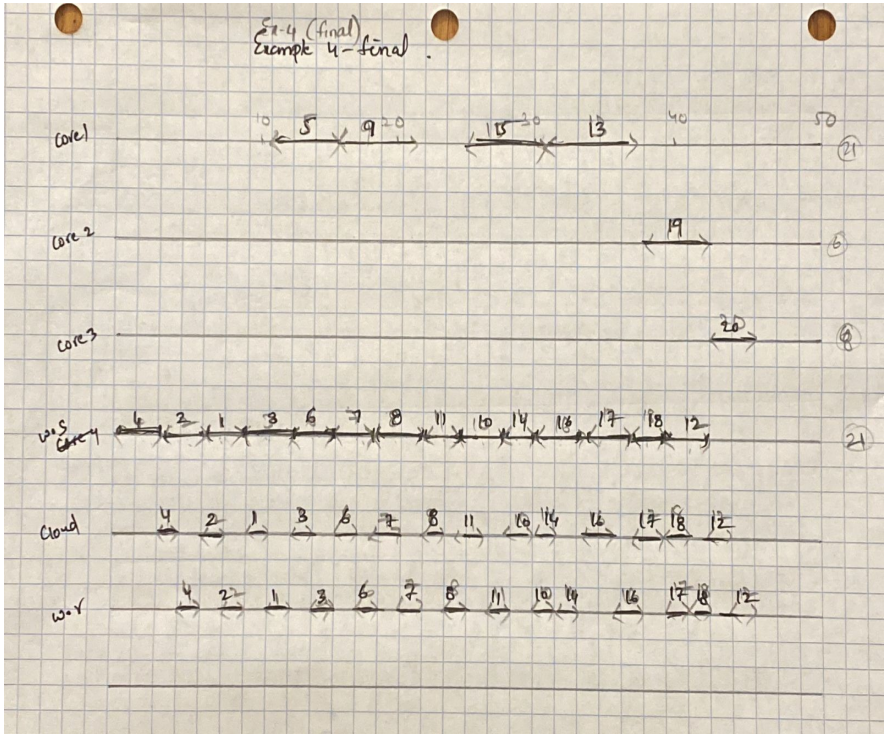
T = 29

Details: 1,2,4 as entry nodes

Example 4 - Final Scheduling Algorithm

```
task - 1 is assigned on cloud :: wireless_send     ready time :: 0  :: start time :: 6  :: finish_time  :: 9
cloud_compute      ready time :: 9  :: start time :: 9  :: finish_time  :: 10
wireless_receive   ready time :: 10  :: start time :: 10  :: finish_time  :: 11
 ================================================================================
task - 2 is assigned on cloud :: wireless_send     ready time :: 0  :: start time :: 3  :: finish_time  :: 6
cloud_compute      ready time :: 6  :: start time :: 6  :: finish_time  :: 7
wireless_receive   ready time :: 7  :: start time :: 7  :: finish_time  :: 8
 ================================================================================
task - 3 is assigned on cloud :: wireless_send     ready time :: 9  :: start time :: 9  :: finish_time  :: 12
cloud_compute      ready time :: 12  :: start time :: 12  :: finish_time  :: 13
wireless_receive   ready time :: 13  :: start time :: 13  :: finish_time  :: 14
 ================================================================================
task - 4 is assigned on cloud :: wireless_send     ready time :: 0  :: start time :: 0  :: finish_time  :: 3
cloud_compute      ready time :: 3  :: start time :: 3  :: finish_time  :: 4
wireless_receive   ready time :: 4  :: start time :: 4  :: finish_time  :: 5
 ================================================================================
task - 5 is assigned on 1 node :: local_compute     ready time :: 11  :: start time :: 11  :: finish_time  :: 16
 ================================================================================
task - 6 is assigned on cloud :: wireless_send     ready time :: 9  :: start time :: 12  :: finish_time  :: 15
cloud_compute      ready time :: 15  :: start time :: 15  :: finish_time  :: 16
wireless_receive   ready time :: 16  :: start time :: 16  :: finish_time  :: 17
 ================================================================================
task - 7 is assigned on cloud :: wireless_send     ready time :: 12  :: start time :: 15  :: finish_time  :: 18
cloud_compute      ready time :: 18  :: start time :: 18  :: finish_time  :: 19
wireless_receive   ready time :: 19  :: start time :: 19  :: finish_time  :: 20
 ================================================================================
task - 8 is assigned on cloud :: wireless_send     ready time :: 15  :: start time :: 18  :: finish_time  :: 21
cloud_compute      ready time :: 21  :: start time :: 21  :: finish_time  :: 22
wireless_receive   ready time :: 22  :: start time :: 22  :: finish_time  :: 23
 ================================================================================
task - 9 is assigned on 1 node :: local_compute     ready time :: 16  :: start time :: 16  :: finish_time  :: 21
 ================================================================================
task - 10 is assigned on cloud :: wireless_send     ready time :: 21  :: start time :: 24  :: finish_time  :: 27
cloud_compute      ready time :: 27  :: start time :: 27  :: finish_time  :: 28
wireless_receive   ready time :: 28  :: start time :: 28  :: finish_time  :: 29
 ================================================================================
task - 11 is assigned on cloud :: wireless_send     ready time :: 21  :: start time :: 21  :: finish_time  :: 24
cloud_compute      ready time :: 24  :: start time :: 24  :: finish_time  :: 25
wireless_receive   ready time :: 25  :: start time :: 25  :: finish_time  :: 26
 ================================================================================
task - 12 is assigned on cloud :: wireless_send     ready time :: 27  :: start time :: 39  :: finish_time  :: 42
cloud_compute      ready time :: 42  :: start time :: 42  :: finish_time  :: 43
wireless_receive   ready time :: 43  :: start time :: 43  :: finish_time  :: 44
 ================================================================================
task - 13 is assigned on 1 node :: local_compute     ready time :: 26  :: start time :: 31  :: finish_time  :: 37
 ================================================================================
task - 14 is assigned on cloud :: wireless_send     ready time :: 27  :: start time :: 27  :: finish_time  :: 30
cloud_compute      ready time :: 30  :: start time :: 30  :: finish_time  :: 31
wireless_receive   ready time :: 31  :: start time :: 31  :: finish_time  :: 32
 ================================================================================
task - 15 is assigned on 1 node :: local_compute     ready time :: 26  :: start time :: 26  :: finish_time  :: 31
 ================================================================================
task - 16 is assigned on cloud :: wireless_send     ready time :: 27  :: start time :: 30  :: finish_time  :: 33
cloud_compute      ready time :: 33  :: start time :: 33  :: finish_time  :: 34
wireless_receive   ready time :: 34  :: start time :: 34  :: finish_time  :: 35
 ================================================================================
task - 17 is assigned on cloud :: wireless_send     ready time :: 24  :: start time :: 33  :: finish_time  :: 36
cloud_compute      ready time :: 36  :: start time :: 36  :: finish_time  :: 37
wireless_receive   ready time :: 37  :: start time :: 37  :: finish_time  :: 38
 ================================================================================
task - 18 is assigned on cloud :: wireless_send     ready time :: 33  :: start time :: 36  :: finish_time  :: 39
cloud_compute      ready time :: 39  :: start time :: 39  :: finish_time  :: 40
wireless_receive   ready time :: 40  :: start time :: 40  :: finish_time  :: 41
 ================================================================================
task - 19 is assigned on 2 node :: local_compute     ready time :: 38  :: start time :: 38  :: finish_time  :: 41
 ================================================================================
task - 20 is assigned on 3 node :: local_compute     ready time :: 41  :: start time :: 41  :: finish_time  :: 43
 ================================================================================
```

Example 4 MCC task graph - Final



Graph - multiple entry points

By calculating energy we get

E1 = 21

E2 = 6

E3 = 8

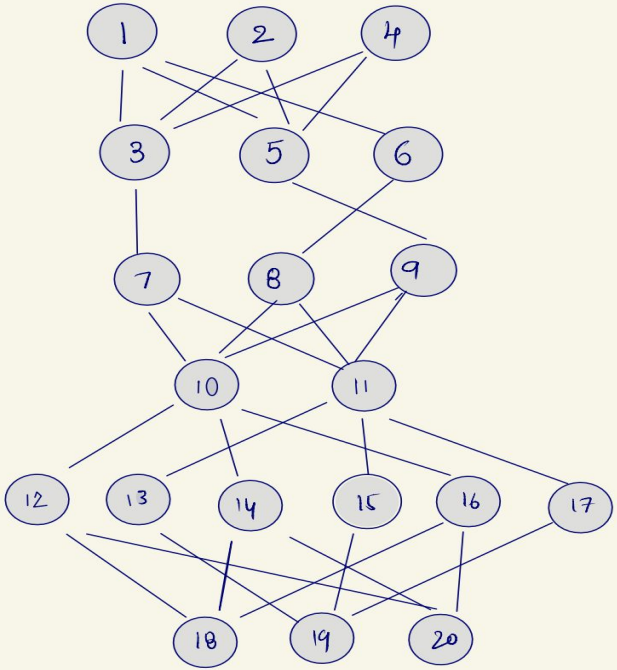
EC= 21

E-Total= 56

T = 43

Observation:: we can see 4 getting scheduled earlier than 1

Example 5

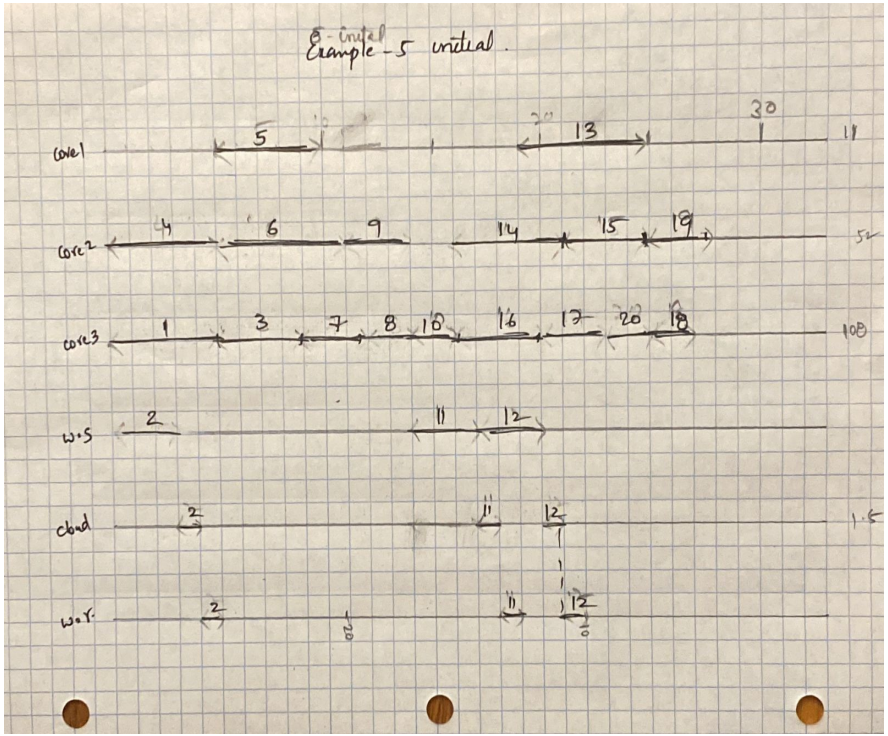


Task no	core 1	core 2	core 3
1	9	7	5
2	8	6	5
3	6	5	4
4	7	5	3
5	5	4	2
6	7	6	4
7	8	5	3
8	6	4	2
9	5	3	2
10	7	4	2
11	9	7	5
12	8	6	5
13	6	5	4
14	7	5	3
15	5	4	2
16	7	6	4
17	8	5	3
18	6	4	2
19	5	3	2
20	7	4	2

Example 5 - Initial Scheduling Algorithm

```
task - 1 is assigned on 3 node :: local_compute     ready time :: 0  :: start time :: 0  :: finish_time  :: 5
 ================================================================================
task - 2 is assigned on cloud :: wireless_send     ready time :: 0  :: start time :: 0  :: finish_time  :: 3
cloud_compute     ready time :: 3  :: start time :: 3  :: finish_time  :: 4
wireless_receive  ready time :: 4  :: start time :: 4  :: finish_time  :: 5
 ================================================================================
task - 3 is assigned on 3 node :: local_compute     ready time :: 5  :: start time :: 5  :: finish_time  :: 9
 ================================================================================
task - 4 is assigned on 2 node :: local_compute     ready time :: 0  :: start time :: 0  :: finish_time  :: 5
 ================================================================================
task - 5 is assigned on 1 node :: local_compute     ready time :: 5  :: start time :: 5  :: finish_time  :: 10
 ================================================================================
task - 6 is assigned on 2 node :: local_compute     ready time :: 5  :: start time :: 5  :: finish_time  :: 11
 ================================================================================
task - 7 is assigned on 3 node :: local_compute     ready time :: 9  :: start time :: 9  :: finish_time  :: 12
 ================================================================================
task - 8 is assigned on 3 node :: local_compute     ready time :: 11  :: start time :: 12  :: finish_time  :: 14
 ================================================================================
task - 9 is assigned on 2 node :: local_compute     ready time :: 10  :: start time :: 11  :: finish_time  :: 14
 ================================================================================
task - 10 is assigned on 3 node :: local_compute     ready time :: 14  :: start time :: 14  :: finish_time  :: 16
 ================================================================================
task - 11 is assigned on cloud :: wireless_send     ready time :: 14  :: start time :: 14  :: finish_time  :: 17
cloud_compute     ready time :: 17  :: start time :: 17  :: finish_time  :: 18
wireless_receive  ready time :: 18  :: start time :: 18  :: finish_time  :: 19
 ================================================================================
task - 12 is assigned on cloud :: wireless_send     ready time :: 16  :: start time :: 17  :: finish_time  :: 20
cloud_compute     ready time :: 20  :: start time :: 20  :: finish_time  :: 21
wireless_receive  ready time :: 21  :: start time :: 21  :: finish_time  :: 22
 ================================================================================
task - 13 is assigned on 1 node :: local_compute     ready time :: 19  :: start time :: 19  :: finish_time  :: 25
 ================================================================================
task - 14 is assigned on 2 node :: local_compute     ready time :: 16  :: start time :: 16  :: finish_time  :: 21
 ================================================================================
task - 15 is assigned on 2 node :: local_compute     ready time :: 19  :: start time :: 21  :: finish_time  :: 25
 ================================================================================
task - 16 is assigned on 3 node :: local_compute     ready time :: 16  :: start time :: 16  :: finish_time  :: 20
 ================================================================================
task - 17 is assigned on 3 node :: local_compute     ready time :: 19  :: start time :: 20  :: finish_time  :: 23
 ================================================================================
task - 18 is assigned on 3 node :: local_compute     ready time :: 21  :: start time :: 25  :: finish_time  :: 27
 ================================================================================
task - 19 is assigned on 2 node :: local_compute     ready time :: 25  :: start time :: 25  :: finish_time  :: 28
 ================================================================================
task - 20 is assigned on 3 node :: local_compute     ready time :: 21  :: start time :: 23  :: finish_time  :: 25
 ================================================================================
================================================================================
```

Example 5 MCC task graph - Initial



Graph - multiple entries and exits:

By calculating energy we get

E1 =11

E2 =52

E3 =108

EC=4.5

E-Total= 175.5

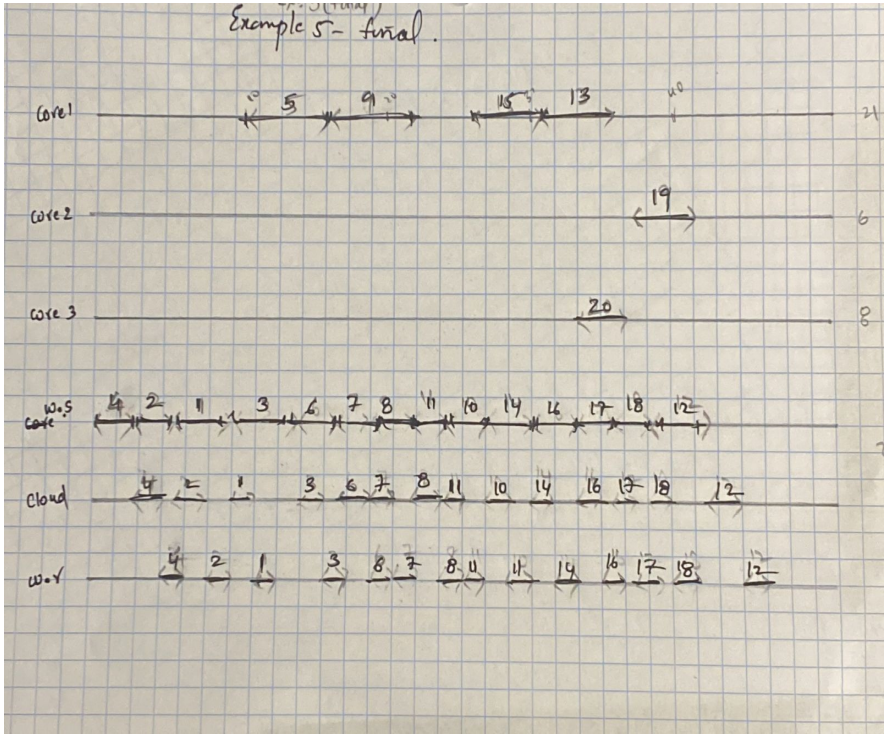
T = 28

Details:1,2,4 as entry nodes and 18,19,20 as exits nodes

Example 5 - Final Scheduling Algorithm

```
task - 1 is assigned on cloud :: wireless_send     ready time :: 0  :: start time :: 6  :: finish_time  :: 9
cloud_compute      ready time :: 9  :: start time :: 9  :: finish_time  :: 10
wireless_receive  ready time :: 10  :: start time :: 10  :: finish_time  :: 11
 ==========================================================================
task - 2 is assigned on cloud :: wireless_send     ready time :: 0  :: start time :: 3  :: finish_time  :: 6
cloud_compute      ready time :: 6  :: start time :: 6  :: finish_time  :: 7
wireless_receive  ready time :: 7  :: start time :: 7  :: finish_time  :: 8
 ==========================================================================
task - 3 is assigned on cloud :: wireless_send     ready time :: 9  :: start time :: 9  :: finish_time  :: 12
cloud_compute      ready time :: 12  :: start time :: 12  :: finish_time  :: 13
wireless_receive  ready time :: 13  :: start time :: 13  :: finish_time  :: 14
 ==========================================================================
task - 4 is assigned on cloud :: wireless_send     ready time :: 0  :: start time :: 0  :: finish_time  :: 3
cloud_compute      ready time :: 3  :: start time :: 3  :: finish_time  :: 4
wireless_receive  ready time :: 4  :: start time :: 4  :: finish_time  :: 5
 ==========================================================================
task - 5 is assigned on 1 node :: local_compute     ready time :: 11  :: start time :: 11  :: finish_time  :: 16
 ==========================================================================
task - 6 is assigned on cloud :: wireless_send     ready time :: 9  :: start time :: 12  :: finish_time  :: 15
cloud_compute      ready time :: 15  :: start time :: 15  :: finish_time  :: 16
wireless_receive  ready time :: 16  :: start time :: 16  :: finish_time  :: 17
 ==========================================================================
task - 7 is assigned on cloud :: wireless_send     ready time :: 12  :: start time :: 15  :: finish_time  :: 18
cloud_compute      ready time :: 18  :: start time :: 18  :: finish_time  :: 19
wireless_receive  ready time :: 19  :: start time :: 19  :: finish_time  :: 20
 ==========================================================================
task - 8 is assigned on cloud :: wireless_send     ready time :: 15  :: start time :: 18  :: finish_time  :: 21
cloud_compute      ready time :: 21  :: start time :: 21  :: finish_time  :: 22
wireless_receive  ready time :: 22  :: start time :: 22  :: finish_time  :: 23
 ==========================================================================
task - 9 is assigned on 1 node :: local_compute     ready time :: 16  :: start time :: 16  :: finish_time  :: 21
 ==========================================================================
task - 10 is assigned on cloud :: wireless_send     ready time :: 21  :: start time :: 24  :: finish_time  :: 27
cloud_compute      ready time :: 27  :: start time :: 27  :: finish_time  :: 28
wireless_receive  ready time :: 28  :: start time :: 28  :: finish_time  :: 29
 ==========================================================================
task - 11 is assigned on cloud :: wireless_send     ready time :: 21  :: start time :: 21  :: finish_time  :: 24
cloud_compute      ready time :: 24  :: start time :: 24  :: finish_time  :: 25
wireless_receive  ready time :: 25  :: start time :: 25  :: finish_time  :: 26
 ==========================================================================
task - 12 is assigned on cloud :: wireless_send     ready time :: 27  :: start time :: 39  :: finish_time  :: 42
cloud_compute      ready time :: 42  :: start time :: 42  :: finish_time  :: 43
wireless_receive  ready time :: 43  :: start time :: 43  :: finish_time  :: 44
 ==========================================================================
task - 13 is assigned on 1 node :: local_compute     ready time :: 26  :: start time :: 31  :: finish_time  :: 37
 ==========================================================================
task - 14 is assigned on cloud :: wireless_send     ready time :: 27  :: start time :: 27  :: finish_time  :: 30
cloud_compute      ready time :: 30  :: start time :: 30  :: finish_time  :: 31
wireless_receive  ready time :: 31  :: start time :: 31  :: finish_time  :: 32
 ==========================================================================
task - 15 is assigned on 1 node :: local_compute     ready time :: 26  :: start time :: 26  :: finish_time  :: 31
 ==========================================================================
task - 16 is assigned on cloud :: wireless_send     ready time :: 27  :: start time :: 30  :: finish_time  :: 33
cloud_compute      ready time :: 33  :: start time :: 33  :: finish_time  :: 34
wireless_receive  ready time :: 34  :: start time :: 34  :: finish_time  :: 35
 ==========================================================================
task - 17 is assigned on cloud :: wireless_send     ready time :: 24  :: start time :: 33  :: finish_time  :: 36
cloud_compute      ready time :: 36  :: start time :: 36  :: finish_time  :: 37
wireless_receive  ready time :: 37  :: start time :: 37  :: finish_time  :: 38
 ==========================================================================
task - 18 is assigned on cloud :: wireless_send     ready time :: 33  :: start time :: 36  :: finish_time  :: 39
cloud_compute      ready time :: 39  :: start time :: 39  :: finish_time  :: 40
wireless_receive  ready time :: 40  :: start time :: 40  :: finish_time  :: 41
 ==========================================================================
task - 19 is assigned on 2 node :: local_compute     ready time :: 38  :: start time :: 38  :: finish_time  :: 41
 ==========================================================================
task - 20 is assigned on 3 node :: local_compute     ready time :: 35  :: start time :: 35  :: finish_time  :: 37
 ==========================================================================
```

Example 5 MCC task graph - Final



Graph - multiple entries:

By calculating energy we get

E1 = 21

E2 = 6

E3 = 8

EC= 21

E-Total= 56

T = 41

Observation:: we can observe task 20 getting scheduled before task 19.

key observations :

- Initial scheduling algorithm - mostly assign the tasks to core 3 as it tries to minimize the time but its energy intensive.
- Kernel algorithm - mostly assigns the tasks to cloud and core 1. It schedules the tasks to core 1 to reduce energy with leverage of time gained by sending tasks to cloud and reduce the overall energy.
- Without time constraint all tasks will be scheduled to the cloud.