

**Assignment-5**  
**Report**  
**180010030,180010032,180020006**

Algorithm	No. of cycles	Throughput
Odd-Even	249	0.024
Fibonacci	3157	0.029
Descending	11433	0.031
Prime	1175	0.028
Palindrome	1983	0.028

- 1) The code for odd-even has no control hazards because the conditional branch was not taken as the value checked was odd. There are a few RAW hazards due to which we see a small number of data hazards.
- 2) For fibonacci, there is a control hazard in the loop. Every time it goes in the loop, it is a wrong branch, till the count reaches 10. So, we see a few control hazards. Similarly, there are a few data hazards outside the loop and a few inside. Hence, we also see some stalls in the pipeline.
- 3) The code for descending has a lot of branching, 3 nested loops and data hazards. Hence, we see that the total number of hazards increases by a large amount and so does the cycles executed.
- 4) For Prime, the loop runs from  $n=2$  to  $n=5$ , i.e. 4 times. All these 4 times, we get a wrong branch taken for the jmp statements. Then it takes a wrong branch when it is supposed to enter prime/not prime. Hence, a total of 10. Similarly, we are getting a few data hazards.

5) In this, every time the code misses the jump to loop, there is a wrong branch taken. So we get a control hazard. But we have more data hazards per loop. Hence, we see a larger number of data hazards than control hazards.

^ Here in all cases we can commonly observe that throughput is almost the same as it is basically a proportion of instruction per cycle.

```
brinal@DESKTOP-E7P8BC x brinal@DESKTOP-E7P8BC x + v - □ ×
21 : 0
22 : 0
23 : 0
24 : 0
25 : 0
26 : 0
27 : 0
28 : 0
29 : 0
30 : 0

Hash of the Processor State = -224294686
brinal@DESKTOP-E7P8BOS:/mnt/e/Code/COA/Github/CS313/Assignment-5$ cat stats.txt
Number of instructions executed = 6
Number of cycles taken = 249
Throughput = 0.024096385
Number of times the OF stage needed to stall because of a datahazard = 4
Number of times an instruction on a wrong branch path entered the pipeline = 0
brinal@DESKTOP-E7P8BOS:/mnt/e/Code/COA/Github/CS313/Assignment-5$ python test_zip.py 180010030_180010032_180020006_Assig
nment-5.zip
Students :
180010030
180010032
180020006
Assignment-5

descending.out : PASS!
evenorodd.out : PASS!
fibonacci.out : PASS!
palindrome.out : PASS!
prime.out : PASS!

total score = 5 out of 5
brinal@DESKTOP-E7P8BOS:/mnt/e/Code/COA/Github/CS313/Assignment-5$
```