1) main() {

    fork()

    fork() → only half of them will be created

    if (fork() == 0)

        fork()

    fork()

}

24 processes - 1 parent = 23 processes are created

2) Speedup with 8 cores = 4

   Speedup with 16 cores = ?

$$\text{Speedup} = \cfrac{1}{S + \cfrac{1-S}{N}}$$

① $N = 8$

  Speedup = 4

$$\cfrac{1}{S + \cfrac{1-S}{N}} = 4$$

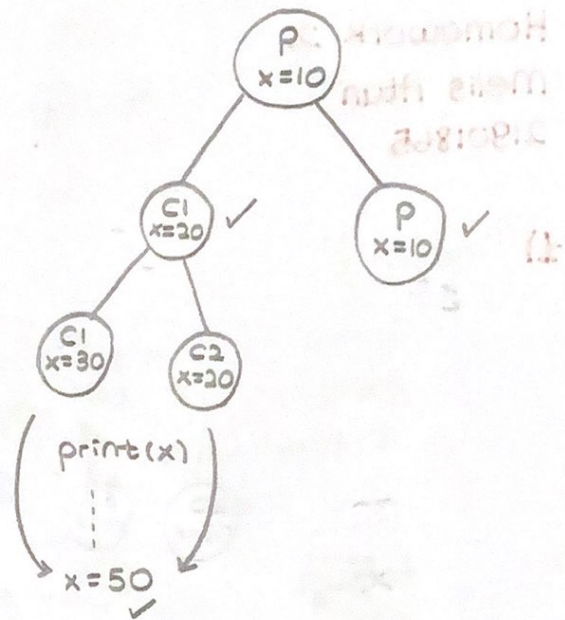$$\cfrac{1}{S + \cfrac{1-S}{8}} = 4 \rightarrow S = \frac{1}{7}$$

② $N = 16 \longrightarrow \cfrac{1}{\frac{1}{7} + \cfrac{1-\frac{1}{7}}{16}} = ?$

$$\cfrac{1}{\frac{1}{7} + \frac{3}{56}} = \frac{56}{11}$$

(8)

3)
```
int x=10;
main () {
    if (fork() == 0) {
        x=20;
        if (fork()==0) {
            x= 30;
        }
        print(x);
        x= 50;
    }
    print(x);
}
```


Output:
```
10
20   } order can
50        change
30   } This order is
50        from Linux
```
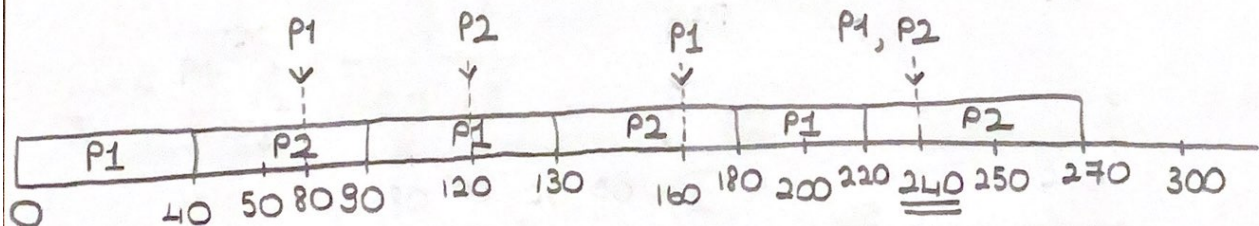
but I think

```
30
20
50   } makes more
50        sense
10
```

4) Show 300 ms timeline
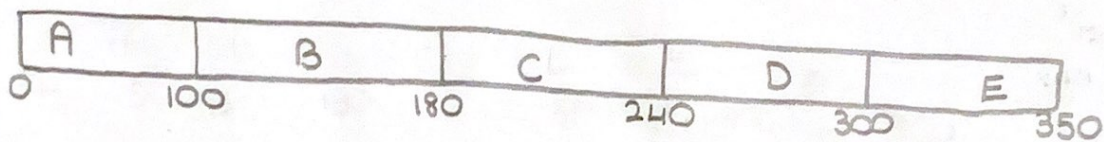
P1: period= 80, cpu=40 ✓

P2: period= 120, cpu= 50 ✓

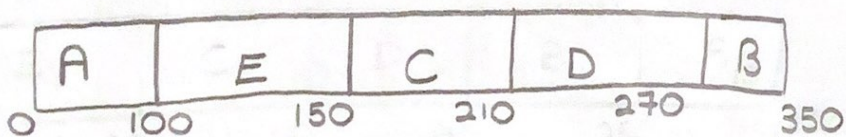P1 and P2 have the same deadline at 240

5.

	Arrival Time		CPU burst	Priority
A	0	1	100	3
B	15	2	80 ✓	1
C	30	3	60 ✓	2
D	35	4	60 ✓	1
E	45	5	50	2

a) FCFS

A		B		C		D		E	
0	100		180		240		300		350

	Finish Time	(Finish–Arrival) Turnaround Time	(Turnaround–Burst) Waiting Time
A	100	100	0
B	180	165	85
C	240	210	150
D	300	265	205
E	350	305	255

b) SJF

A	E	C	D	B
0	100	150	210	270	350

	Finish Time	Turnaround Time	Waiting Time
A	100	100	0
B	350	335	255
C	210	180	120
D	270	235	175
E	150	105	55

C) SRTF

A	B	C	E	D	B	A
0 15   30   90   140 200 265 350
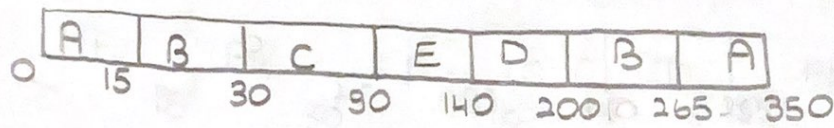
	Finish Time	Turnaround Time	Waiting Time
A	350	350	250
B	265	250	170
C	90	60	0
D	200	165	105
E	140	95	45

d) RR (q=20)

A   B   A   C   D   B   E   A   C   D   B
0 20 40 60 80 100 120 140 160 180 200 220

E   A   C   D   B   E   A
220 240 260 280 300 320 330 350
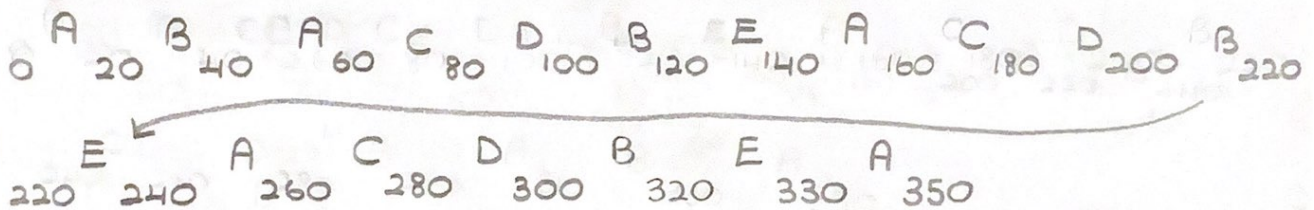
	Finish Time	Turnaround Time	Waiting Time
A	350	350	250
B	320	305	225
C	280	250	190
D	300	265	205
E	330	295	245

e) Priority

A 0 20 B 40 D 60 B 80 D 100 B 120 D 140 B 160 C 180 E 200

C 200 220 E 240 C 260 E 270 A 280 A 310 A 330 A 350
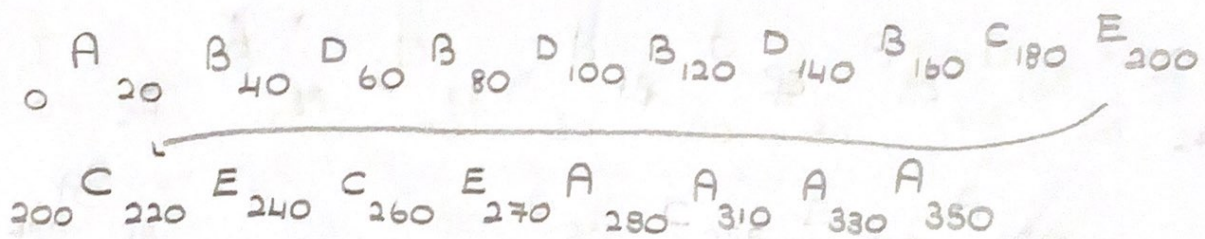
	Finish Time	Turnaround Time	Waiting Time
A	350	350	250
B	160	140	45
C	260	100	170
D	140	100	45
E	270	90	175

6.

(A) $\alpha = 0.8$

20, 10, 40, 30, 20

exponential averaging $= T_{n+1} = \alpha t_n + (1-\alpha) T_n$ → predicted burst time

↓ actual burst time

$T_1 = (0.8)\,20 + (0.2)\,10 = 18$

$T_2 = (0.8)\,10 + (0.2)\,18 = 11.6$

$T_3 = (0.8)\,40 + (0.2)\,11.6 = 34.32$

$T_4 = (0.8)\,30 + (0.2)\,34.32 = 30.864$

$T_5 = (0.8)\,20 + (0.2)\,30.864 = 22.1728$

(B)

30, 20, 40, 10

$T_1 = (0.8)\,30 + (0.2)\,10 = 26$

$T_2 = (0.8)\,20 + (0.2)\,26 = 21.2$

$T_3 = (0.8)\,40 + (0.2)\,21.2 = 36.24$

$T_4 = (0.8)\,10 + (0.2)\,36.24 = 15.248$

$$B < A$$

15.248   22.1728

7.

$$\longrightarrow \text{Random}$$

R   2200   300   number

100   2200   300

$$\downarrow$$

Local variable

&

No value assigned