

## Multiple server queues

Consider a system modelled with an M/M/c queue, with the service demand reported in the attached table. Consider the system under different workloads according to the minimum and maximum values reported in the attached table. In particular, consider 51 equally spaced arrival rates between the two values taken from the table. Consider also different configurations, varying the number of servers from  $c=1$  to  $c=8$

For each arrival rate / number of servers couple determine:

- If the system stable
- The average response time (if possible)
- The average time spent in queue (if possible)
- The average queue length of the system (if possible)
- The probability of having the system empty (if possible)
- The minimum number of servers (if possible) to have an average service time less than the threshold reported in the table.

Plot the results to emphasize the analysis.

Chose the appropriate set of model parameters according to the last two digits on the right (the least significant) of your "Codice Persona". **This exercise is mandatory and must be presented at the exam!**

Which					Service	Arrival Rate [job/sec.]		Resp. Time
Last digitis of "Codice Persona"					Time [sec.]	min	max	threshold
00	20	40	60	80	1	1	8	1,5
01	21	41	61	81	1	0,5	12	2
02	22	42	62	82	10	0,02	0,8	20
03	23	43	63	83	2	0,5	5	4
04	24	44	64	84	10	0,02	0,6	20
05	25	45	65	85	10	0,4	1	80
06	26	46	66	86	5	0,04	4	7,5
07	27	47	67	87	10	0,02	1,2	40
08	28	48	68	88	10	0,05	0,5	40
09	29	49	69	89	5	0,04	2	10
10	30	50	70	90	2	2	3	4
11	31	51	71	91	5	0,4	2,4	10
12	32	52	72	92	2	0,1	10	3
13	33	53	73	93	10	0,4	0,5	40
14	34	54	74	94	1	4	10	2
15	35	55	75	95	2	1	2,5	16
16	36	56	76	96	10	0,2	0,5	20
17	37	57	77	97	1	4	6	2
18	38	58	78	98	5	0,04	2,4	40
19	39	59	79	99	2	1	10	3
Friday class					5	0,2	2	7,5
Monday					10	0,4	0,8	80