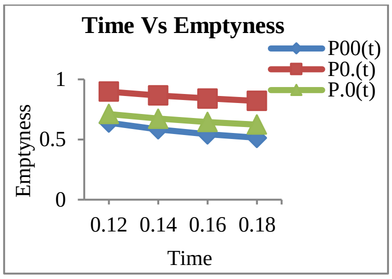
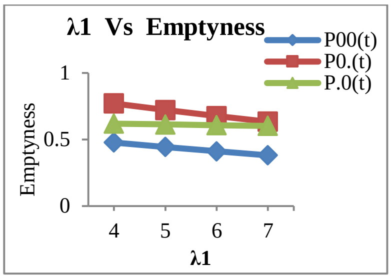
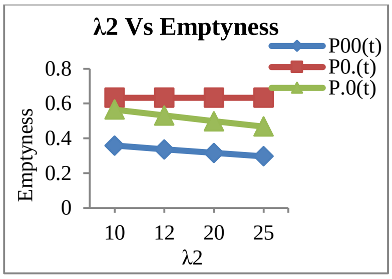
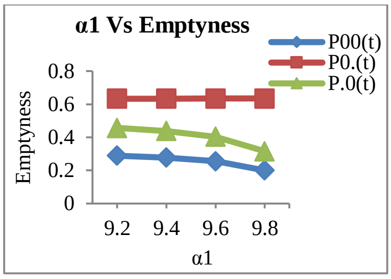
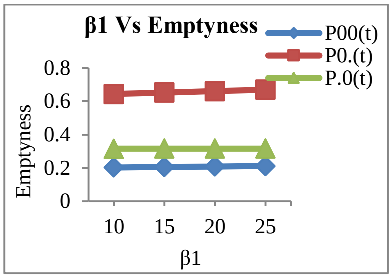
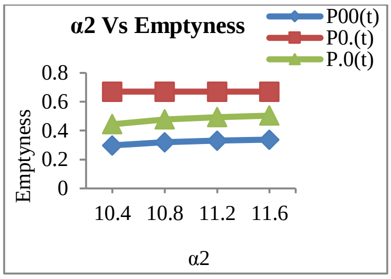

Time Vs Emptyness
P00(t)
P0.(t)
P.0(t)
Emptyness
1
0.5
0
0.12 0.14 0.16 0.18
Time

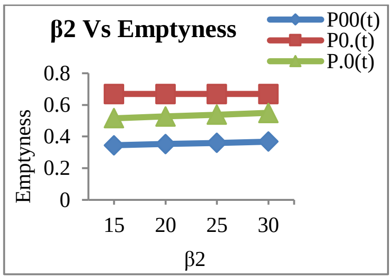

λ1 Vs Emptyness
P00(t)
P0.(t)
P.0(t)
Emptyness
1
0.5
0
4 5 6 7
λ1

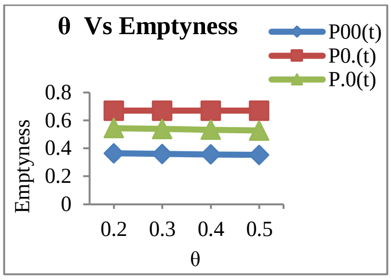

λ2 Vs Emptyness
P00(t)
P0.(t)
P.0(t)
Emptyness
0.8
0.6
0.4
0.2
0
10 12 20 25
λ2

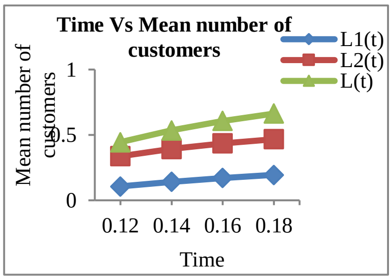

α1 Vs Emptyness
P00(t)
P0.(t)
P.0(t)
Emptyness
0.8
0.6
0.4
0.2
0
9.2 9.4 9.6 9.8
α1

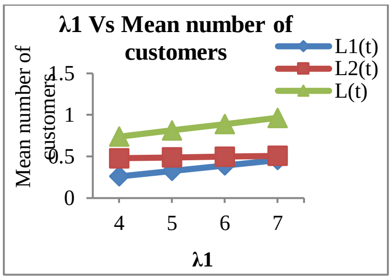

β1 Vs Emptyness
P00(t)
P0.(t)
P.0(t)
Emptyness
0.8
0.6
0.4
0.2
0
10 15 20 25
β1


α2 Vs Emptyness
P00(t)
P0.(t)
P.0(t)
Emptyness
0.8
0.6
0.4
0.2
0
10.4 10.8 11.2 11.6
α2


β2 Vs Emptyness
P00(t)
P0.(t)
P.0(t)
Emptyness
0.8
0.6
0.4
0.2
0
15 20 25 30
β2


θ Vs Emptyness
P00(t)
P0.(t)
P.0(t)
Emptyness
0.8
0.6
0.4
0.2
0
0.2 0.3 0.4 0.5
θ


Time Vs Mean number of customers
L1(t)
L2(t)
L(t)
Mean number of customers
1
0.5
0
0.12 0.14 0.16 0.18
Time


λ1 Vs Mean number of customers
L1(t)
L2(t)
L(t)
Mean number of customers
1.5
1
0.5
0
4 5 6 7
λ1

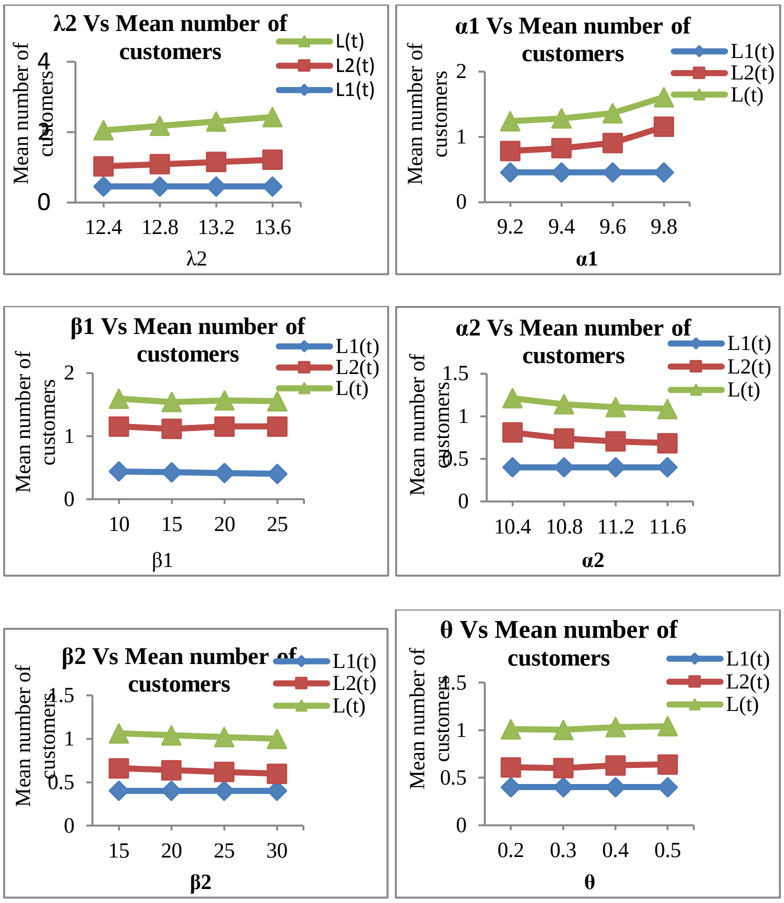


Figure 2: The relationship between the parameters and performance measures

It is also observed that as the service rate parameter (β_1) varies from 10 to 25, the probability of emptiness of the system, first and second queues increase from 0.20307 to 0.21127, 0.64354 to 0.66909 and 0.31555 to 0.31575 respectively, the mean number of customers in the system, first and second queues decrease from 1.59422to 1.55463, 0.44077 to 0.40183 and 1.15345 to 1.1528respectively, when all other parameters are fixed.

It is observed that as the service rate parameter (α_2) increases from 10.4 to 11.6, the probability of emptiness of the system and second queue increase from 0.29741 to 0.33734 and 0.44449 to 0.50418 respectively and in the first queue it remains constant. The mean number of customers in the system and second queue decreases from 1.21265 to 1.08665 and 0.81082 to 0.68482, but in the first queue it remains constant, when all other parameters are fixed. It is also observed that as the service rate parameter (β_2) increases from 15 to 30, the probability of emptiness of the system, second queue increase from 0.34519to 0.36756, 0.5159 to 0.54932 and in the first queue it remains constant, when all other parameters are fixed.

It is also observed that as the service rate parameter (θ) increases from 0.2 to 0.5, the probability of emptiness of system and second queue decrease from 0.36371 to 0.35243, 0.54358 to 0.52673 respectively. The mean number of customers in the system and second queue increase from 0.60763 to 0.81358 and 0.60958 to 0.64107 respectively, but in the first queue it remains constant, when all other parameters are fixed.

From Table 2, it is observed that the utilization of the service stations, throughput of the service stations, and the waiting time of a customer in each queue are highly sensitive with respect to time. As time (t) increases, the utilization of service station, the throughput of service station, the average waiting time of a customers in first and second queue increase, when all other parameters are fixed.

It is further observed that as the arrival parameter (λ_1) increases, the utilization of service station, the throughput of service station, the average waiting time of a customers in each queue increase, when all other parameters are fixed. It is further observed that as the arrival parameter (λ_2) increases, the utilization of service station, the throughput of service station, the average waiting time of a customers in second queue increase and in the first queue it remains constant, when all other parameters are fixed.

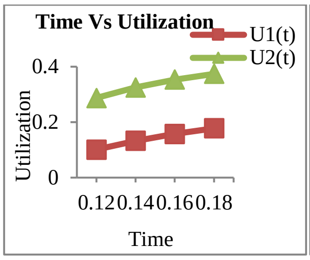
It is also observed that as the service rate (α_1) increases, the utilization of service station, the throughput of service station in first and second queue increase, and the average waiting time of a customers in first queue decrease and in the second queue it increase, when all other parameters are fixed. It is also observed that as the service rate (β_1) increases, the utilization of service station in each queue decrease; the throughput of service station in first queue increases and in second queue it decreases. The average waiting time of customers in each queue decrease, when all other parameters are fixed.

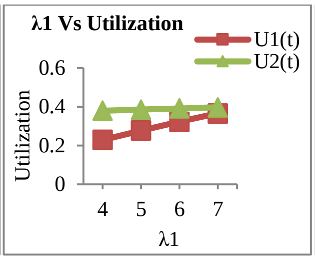
It is also observed that as the service rate (α_2) increases, the utilization of service station in second queue decreases and it remains constant in the first queue. The throughput of service station in second queue decreases and it remains constant in the first queue. The average waiting time of customers in second queue decreases, when all other parameters are fixed. It is also observed that as the service rate (β_2) increases, the utilization of service station in second queue decreases, the throughput of service station in second queue decreases, the average waiting time of a customers in second queue decreases and they remain constant in the first queue. When all other parameters are fixed.

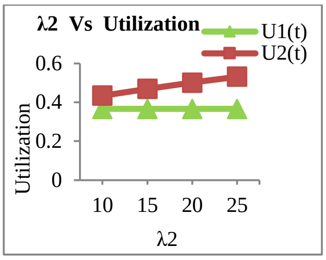
Table2

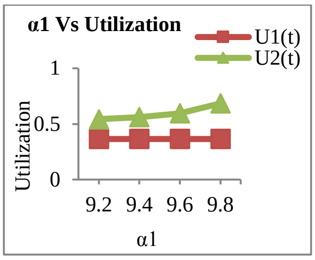
Values of U_1 (t), U_2 (t), Thp_1 (t), Thp_2 (t), W_1(t), W_2(t) for different values of parameters

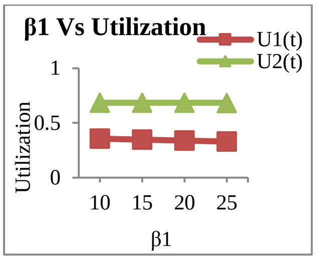
t	λ_1	λ_2	α_1	β_1	α_2	β_2	θ	π	U_1(t)	U_2(t)	Thp_1(t)	Thp_2(t)	W_1(t)	W_2(t)
0.12	3	7	9	5	10	10	0.1	0.9	0.10097	0.28683	0.96933	3.2125	0.10981	0.10523
0.14									0.13265	0.32512	1.28672	3.70632	0.1106	0.10609
0.16									0.15769	0.3534	1.54534	4.09944	0.11105	0.10636
0.18									0.17747	0.37416	1.75696	4.41511	0.1112	0.10615
	4								0.22933	0.38017	2.27036	4.48603	0.11474	0.10662
	5								0.27792	0.38613	2.7514	4.55628	0.11835	0.1071
	6								0.32345	0.39202	3.20211	4.62585	0.12203	0.10757
	7								0.3661	0.39786	3.6244	4.69475	0.12578	0.10805
		8							0.3661	0.43452	3.6244	5.12734	0.12578	0.11118
		9							0.3661	0.46895	3.6244	5.5336	0.12578	0.11437
		10							0.3661	0.50128	3.6244	5.91512	0.12578	0.11762
		11							0.3661	0.53165	3.6244	6.27341	0.12578	0.12091
			9.2						0.36625	0.54322	3.69916	6.40997	0.1233	0.12224
			9.4						0.36618	0.56175	3.77167	6.6286	0.1209	0.12445
			9.6						0.36591	0.59641	3.84202	7.03763	0.11857	0.12893
			9.8						0.36545	0.68455	3.91028	8.07766	0.11632	0.14283
				10					0.35646	0.68455	4.1349	8.07657	0.1066	0.14281
				15					0.3477	0.68437	4.34631	8.07562	0.0983	0.1428
				20					0.33919	0.68431	4.54513	8.07481	0.09115	0.14279
				25					0.33919	0.68425	4.73198	8.07412	0.08492	0.14278
					10.4				0.33919	0.55551	4.73198	6.7772	0.08492	0.11964
					10.8				0.33919	0.52269	4.73198	6.5859	0.08492	0.1123
					11.2				0.33919	0.50646	4.73198	6.58404	0.08492	0.10725
					11.8				0.33919	0.49582	4.73198	6.64398	0.08492	0.10307
						15			0.33919	0.4841	4.73198	6.92257	0.08492	0.09561
						20			0.33919	0.47266	4.73198	7.1845	0.08492	0.08907
						25			0.33919	0.46153	4.73198	7.43059	0.08492	0.08331
						30			0.33919	0.45068	4.73198	7.66161	0.08492	0.07819
							0.2	0.8	0.33919	0.45642	4.73198	7.75913	0.08492	0.07856
							0.3	0.7	0.33919	0.4621	4.73198	7.85563	0.08492	0.07893
							0.4	0.6	0.33919	0.46771	4.73198	7.95112	0.08492	0.07931
							0.5	0.5	0.33919	0.47327	4.73198	8.04561	0.08492	0.07968

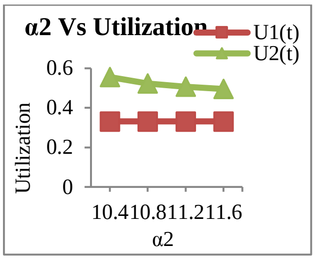

Time Vs Utilization
U1(t)
U2(t)
Utilization
0.4
0.2
0
0.12 0.14 0.16 0.18
Time

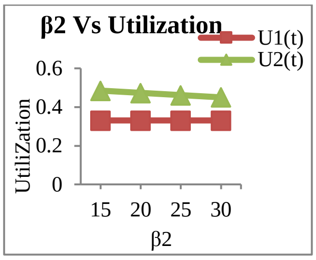

λ1 Vs Utilization
U1(t)
U2(t)
Utilization
0.6
0.4
0.2
0
4 5 6 7
λ1

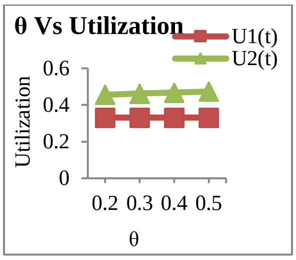

λ2 Vs Utilization
U1(t)
U2(t)
Utilization
0.6
0.4
0.2
0
10 15 20 25
λ2

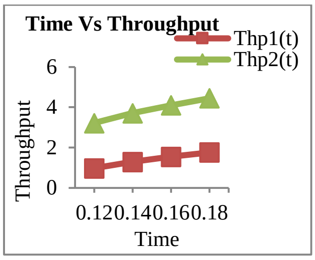

α1 Vs Utilization
U1(t)
U2(t)
Utilization
1
0.5
0
9.2 9.4 9.6 9.8
α1

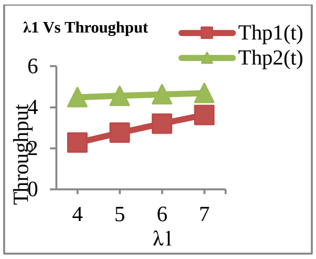

β1 Vs Utilization
U1(t)
U2(t)
Utilization
1
0.5
0
10 15 20 25
β1

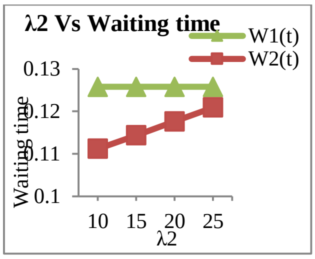

α2 Vs Utilization
U1(t)
U2(t)
Utilization
0.6
0.4
0.2
0
10.4 10.8 11.2 11.6
α2

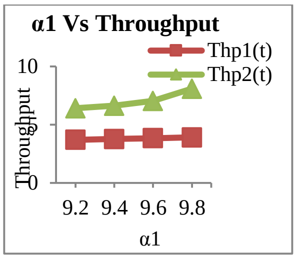

β2 Vs Utilization
U1(t)
U2(t)
UtiliZation
0.6
0.4
0.2
0
15 20 25 30
β2

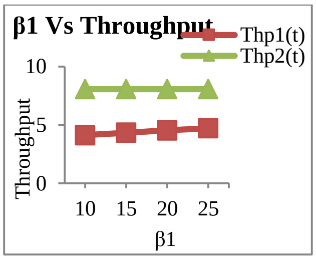

θ Vs Utilization
U1(t)
U2(t)
Utilization
0.6
0.4
0.2
0
0.2 0.3 0.4 0.5
θ

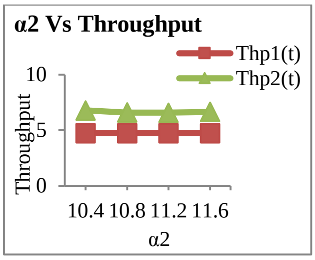

Time Vs Throughput
Thp1(t)
Thp2(t)
Throughput
6
4
2
0
0.12 0.14 0.16 0.18
Time

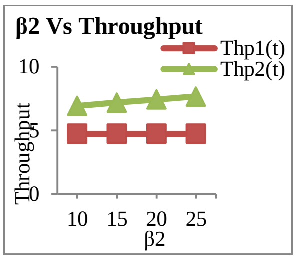

λ1 Vs Throughput
Thp1(t)
Thp2(t)
Throughput
6
4
2
0
4 5 6 7
λ1

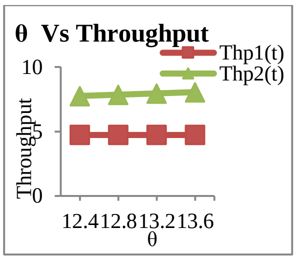

λ2 Vs Waiting time
W1(t)
W2(t)
Waiting time
0.13
0.12
0.11
0.1
10 15 20 25
λ2

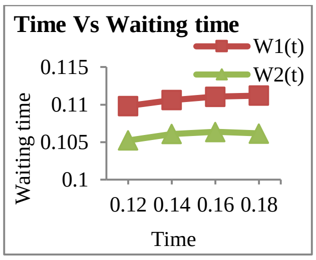

α1 Vs Throughput
Thp1(t)
Thp2(t)
Throughput
10
5
0
9.2 9.4 9.6 9.8
α1

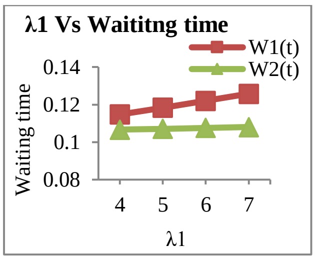

β1 Vs Throughput
Thp1(t)
Thp2(t)
Throughput
10
5
0
10 15 20 25
β1


α2 Vs Throughput
Thp1(t)
Thp2(t)
Throughput
10
5
0
10.4 10.8 11.2 11.6
α2


β2 Vs Throughput
Thp1(t)
Thp2(t)
Throughput
10
5
0
10 15 20 25
β2


θ Vs Throughput
Thp1(t)
Thp2(t)
Throughput
10
5
0
12.4 12.8 13.2 13.6
θ


Time Vs Waiting time
W1(t)
W2(t)
Waiting time
0.115
0.11
0.105
0.1
0.12 0.14 0.16 0.18
Time


λ1 Vs Waititng time
W1(t)
W2(t)
Waiting time
0.14
0.12
0.1
0.08
4 5 6 7
λ1

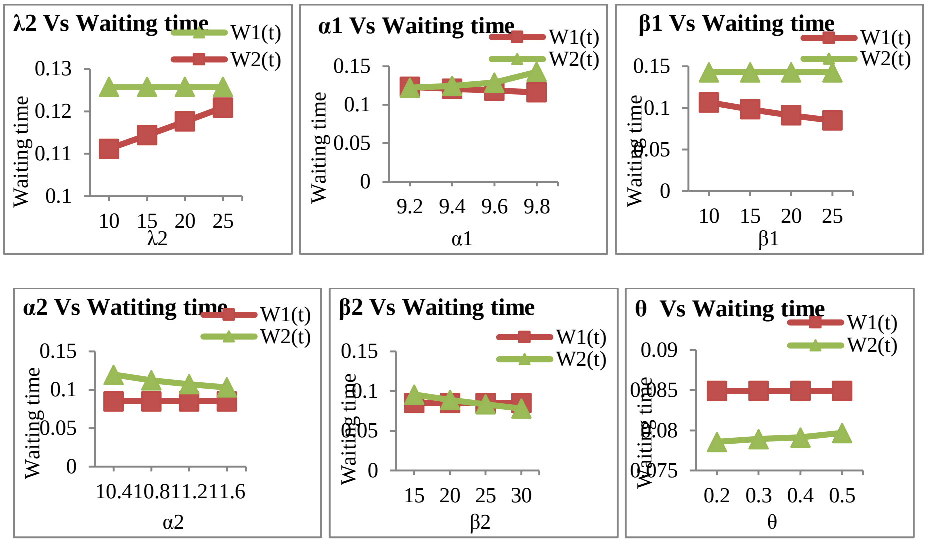


Figure 3: The relationship between the parameters and performance measures

From Table 3, it is observed that the variance and coefficient of variation of number of customers in each queue are highly sensitive with respect to time. As time (t) increases, the variance of the number of customers in first and second queues increase, the coefficient of variation of number of customers in first and second queues decrease, when all other parameters are fixed.

It is further observed that as the arrival rate(λ_1) increases, the variance of the number of customers in each queue increase, the coefficient of variation of number of customers in each queue decrease, the coefficient of variation of number of customers in each queue decreases, when all other parameters are fixed. It is further observed that as the arrival rate (λ_2) increases, the variance of the number of customers in system, second queue increase, the coefficient of variation of number of customers in second queue decreases, when all other parameters are fixed.

It is also observed that as the service rate parameter (α_1) increases, the variance of the number of customers in the system, in the first queue and second queues increase; the coefficient of variation of number of customers in first and second queues decrease, when all other parameters are fixed. It is also observed that as the service rate parameter (β_1) increases, the variance of the number of customers in each queue decreases, the coefficient of variation of number of customers in each queue decrease, when all other parameters are fixed.

It is also observed that as the service rate parameter (α_2) increases, the variance of the number of customers in second queue decreases, the coefficient of variation of number of customers in second queue decreases, when all other parameters are fixed. It is also observed that as the service rate parameter (β_2) increases, the variance of the number of customers in second queue decreases, the coefficient of variation of number of customers in second queue increases, and it remains constant in the first queue, when all other parameters are fixed.

Table 3

Values of $U_1(t)$, $U_2(t)$, $Thp_1(t)$, $Thp_2(t)$, $W_1(t)$, $W_2(t)$ for different values of parameters

t	λ_1	λ_2	α_1	β_1	α_2	β_2	θ	π	$V_1(t)$	$V_2(t)$	V(t)	$CV_1(t)$	$CV_2(t)$
0.12	3	7	8	5	10	10	0.1	0.9	0.10644	0.33804	0.44448	306.51099	171.99623
0.14									0.14231	0.39321	0.53552	265.07899	159.47247
0.16									0.1716	0.43603	0.60763	241.39897	151.44096
0.18									0.19537	0.46866	0.66403	226.2404	146.07285
	4								0.26049	0.47831	0.7388	195.92994	144.59176
	5								0.32562	0.48796	0.81358	175.24506	143.15483
	6								0.39074	0.49761	0.88835	159.97612	141.7599
	7								0.45587	0.50727	0.96314	148.10911	140.40498
		8							0.45587	0.57008	1.02595	148.10911	132.44381
		9							0.45587	0.6329	1.08877	148.10911	125.69947
		10							0.45587	0.69571	1.15158	148.10911	119.89053
		11							0.45587	0.75853	1.2144	148.10911	114.81903
			9.2						0.45611	0.78355	1.23966	148.06989	112.97106
			9.4						0.45599	0.82496	1.28095	148.08831	110.09932
			9.6						0.45556	0.90735	1.36291	148.15888	140.98121
			9.8						0.45483	1.15375	1.60858	148.27681	93.09888
				10					0.44077	1.15345	1.59422	150.62468	93.11078
				15					0.42726	1.1532	1.58046	152.98721	93.12105
				20					0.41429	1.15298	1.56727	155.36356	93.12985
				25					0.40183	1.1528	1.55463	157.75289	93.13732
					10.4				0.40183	0.81082	1.21265	157.75289	111.05469
					10.8				0.40183	0.73959	1.14142	157.75289	116.27984
					11.2				0.40183	0.70616	1.10799	157.75289	119.00036
					11.8				0.40183	0.68482	1.08665	157.75289	120.84024
						15			0.40183	0.66183	1.06366	157.75289	122.92083
						20			0.40183	0.63992	1.04175	157.75289	125.00792
						25			0.40183	0.61902	0.44448	157.75289	127.10077
						30			0.40183	0.59908	0.53552	157.75289	129.19861
							0.2	0.8	0.40183	0.60958	0.60763	157.75289	128.0813
							0.3	0.7	0.40183	0.62007	0.66403	157.75289	126.99248
							0.4	0.6	0.40183	0.63057	0.7388	157.75289	125.93097
							0.5	0.5	0.40183	0.64107	0.81358	157.75289	124.89564

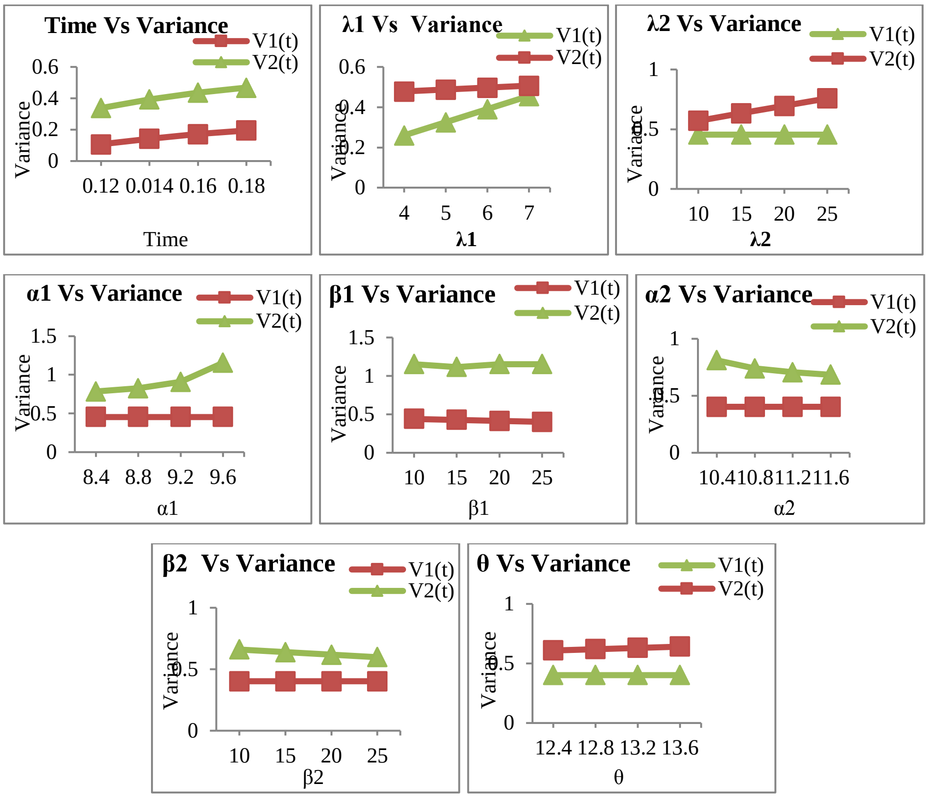


Figure 4: The relationship between the parameters and performance measures

5. SENSITIVITY ANALYSIS

Sensitivity analysis of the model is performed with respect to the variation in value of time(t), arrival rates λ_1, λ_2 service rates of the first and second servers$\mu_1(t)$ and $\mu_2(t)$, and all parameters together on the mean number of customers in the first and second queues ,the utilization of service station in first, second queues ,the mean delay in the first and second queues and the throughput of service stations.

For different values of t, λ_1, λ_2, α_1, β_1, α_2, β_2, θ the mean number of customers in the first and second queue, the utilization of service station in first and second queue, the mean delay in the first queue and second queue and the throughput of service station in first and second queue are computed with variation of -10%, -5%, 0%, 5%, 10% are computed and are given in Table 4.

From Table 4 it is observed that the performance measures are highly affected by the variations in time and other parameters of the model.

Table 4

The values of $L_1(t)$, $L_2(t)$, $U_1(t)$, $U_2(t)$, $Thp_1(t)$, $Thp_2(t)$, $W_1(t)$, $W_2(t)$ for different values of t, λ, α_1, β_1, α_2, β_2, α_3, and β_3.

Parameter	Performance measure	% change in parameters				
		-10	-5	0	5	10
t =0.20	L1(t)	0.45587	0.47943	0.50053	0.51939	0.53620
	L2(t)	0.34280	0.34875	0.35378	0.35800	0.36148
	U1(t)	0.36610	0.38086	0.39379	0.40512	0.41503
	U2(t)	0.29022	0.29443	0.29797	0.30093	0.30335
	W1(t)	0.12578	0.12651	0.12711	0.12757	0.12792
	W2(t)	0.09603	0.09552	0.09498	0.09442	0.09383
	Thp1(t)	3.62440	3.78959	3.93793	4.07143	4.19182
	Thp2(t)	3.5697	3.6509	3.72466	3.79168	3.85589
λ= 7	L1(t)	0.45048	0.47551	0.50053	0.52556	0.55059
	L2(t)	0.35157	0.35268	0.35378	0.35489	0.35600
	U1(t)	0.36268	0.37843	0.39379	0.40878	0.42339
	U2(t)	0.29642	0.2972	0.29797	0.29875	0.29952
	W1(t)	0.12421	0.12565	0.12711	0.12857	0.13004
	W2(t)	0.09489	0.09493	0.09498	0.09503	0.09508
	Thp1(t)	3.62678	3.7843	3.93793	4.08776	4.23388
	Thp2(t)	3.70522	3.71495	3.72466	3.73436	3.74405
λ2 = 5	L1(t)	0.50053	0.50053	0.50053	0.50053	0.50053
	L2(t)	0.32062	0.3372	0.35378	0.37037	0.38695
	U1(t)	0.39379	0.39379	0.39379	0.39379	0.39379
	U2(t)	0.2743	0.28623	0.29797	0.30952	0.32087
	W1(t)	0.12711	0.12711	0.12711	0.12711	0.12711
	W2(t)	0.09351	0.09424	0.09498	0.09573	0.09647
	Thp1(t)	3.93793	3.93793	3.93793	3.93793	3.93793
	Thp2(t)	3.42874	3.57793	3.72466	3.86898	4.01093
α 1=9	L1(t)	0.50293	0.50278	0.50053	0.49667	0.49157
	L2(t)	0.33424	0.34202	0.35378	0.37473	0.4257
	U1(t)	0.39525	0.39515	0.39379	0.39145	0.38833
	U2(t)	0.28412	0.28967	0.29797	0.31253	0.34668
	W1(t)	0.13983	0.13323	0.12711	0.12142	0.11613
	W2(t)	0.09411	0.09446	0.09498	0.09592	0.09823
	Thp1(t)	3.59674	3.77369	3.93793	4.09064	4.23284
	Thp2(t)	3.55149	3.62086	3.72466	3.90657	4.33356
β1 = 5	L1(t)	0.50250	0.50151	0.50053	0.49955	0.49858
	L2(t)	0.35382	0.35380	0.35378	0.35377	0.35375
	U1(t)	0.39498	0.39439	0.39379	0.3932	0.39261
	U2(t)	0.29800	0.29798	0.29797	0.29796	0.29795

	W1(t)	0.12851	0.12780	0.12711	0.12642	0.12573
	W2(t)	0.09499	0.09498	0.09498	0.09498	0.09498
	Thp1(t)	3.91033	3.92415	3.93793	3.95165	3.96532
	Thp2(t)	3.72495	3.7248	3.72466	3.72452	3.72437
α 2 = 10.5	L1(t)	0.50053	0.50053	0.50053	0.50053	0.50053
	L2(t)	0.50445	0.39001	0.35378	0.33434	0.32099
	U1(t)	0.39379	0.39379	0.39379	0.39379	0.39379
	U2(t)	0.39616	0.32295	0.29797	0.28419	0.27457
	W1(t)	0.12711	0.12711	0.12711	0.12711	0.12711
	W2(t)	0.11121	0.10085	0.09498	0.09032	0.08628
	Thp1(t)	3.93793	3.93793	3.93793	3.93793	3.93793
	Thp2(t)	4.53606	3.8673	3.72466	3.70155	3.72044
β2 = 12	L1(t)	0.50053	0.50053	0.50053	0.50053	0.50053
	L2(t)	0.35702	0.3554	0.35378	0.35218	0.35059
	U1(t)	0.39379	0.39379	0.39379	0.39379	0.39379
	U2(t)	0.30024	0.2991	0.29797	0.29685	0.29572
	W1(t)	0.12711	0.12711	0.12711	0.12711	0.12711
	W2(t)	0.09668	0.09582	0.09498	0.09416	0.09335
	Thp1(t)	3.93793	3.93793	3.93793	3.93793	3.93793
	Thp2(t)	3.69299	3.7089	3.72466	3.74026	3.7557
θ=0.1	L1(t)	0.50053	0.50053	0.50053	0.50053	0.50053
	L2(t)	0.35152	0.35268	0.35378	0.35489	0.356
	U1(t)	0.39379	0.39379	0.39379	0.39379	0.39379
	U2(t)	0.29642	0.2972	0.29797	0.29875	0.29952
	W1(t)	0.12711	0.12711	0.12711	0.12711	0.12711
	W2(t)	0.09489	0.09493	0.09498	0.09503	0.09508
	Thp1(t)	3.93793	3.93793	3.93793	3.93793	3.93793
	Thp2(t)	3.70522	3.71495	3.72466	3.73439	3.74405
All parameters	L1(t)	0.40548	0.45637	0.50053	0.53823	0.56987
	L2(t)	0.32301	0.34019	0.35378	0.36426	0.37205
	U1(t)	0.33334	0.36642	0.39379	0.41622	0.4344
	U2(t)	0.27603	0.28836	0.29797	0.30529	0.31068
	W1(t)	0.13652	0.13176	0.12711	0.12254	0.11808
	W2(t)	0.10571	0.10015	0.09498	0.09019	0.08572
	Thp1(t)	2.97009	3.4636	3.93793	4.39217	4.8262
	Thp2(t)	3.05569	3.39691	3.72466	4.03894	4.34023

6. COMPARATIVE STUDY

The comparative study of the developed model with that of Poisson service processes is presented in this section. The performance measure of both models are presented in the Table5 for different values of t= 0.14, 0.16, 0.18, 2. With respect to performance measures.

From Table 5, it is observed that as time increases the percentage variation of the performance measures between the two models is increasing. It is observed that the assumption of non-homogeneous Poisson service process has a significant influence on all the performance measures of the queueing model. Also time has a significant effect on the system performance. The proposed model can predict the performance of the system more accurately.

Table 5

Comparative study of models with Non-Homogeneous and Homogeneous Poisson service rates

t	Parameter Measure	Non-Homogeneous service rate	Homogeneous service rate	Difference	Percentage of Variation
0.14	$L_1(t)$	0.12919	0.13029	0.0011	0.85146
	$L_2(t)$	0.3588	0.3724	0.0136	3.79041
	$U_1(t)$	0.12119	0.12216	0.00097	0.8004
	$U_2(t)$	0.30149	0.31092	0.00943	3.1278
	$W_1(t)$	0.12253	0.13332	0.01079	8.80601
	$W_2(t)$	0.1044	0.11977	0.01537	14.7222
0.16	$L_1(t)$	0.16348	0.16647	0.00299	1.82897
	$L_2(t)$	0.40844	0.43015	0.02171	5.31535
	$U_1(t)$	0.15082	0.15335	0.00253	1.6775
	$U_2(t)$	0.33531	0.34959	0.01428	4.25875
	$W_1(t)$	0.12318	0.13569	0.01251	10.1559
	$W_2(t)$	0.10501	0.12304	0.01803	17.1698
0.18	$L_1(t)$	0.19194	0.1973	0.00536	2.79254
	$L_2(t)$	0.4466	0.47767	0.03107	6.95701
	$U_1(t)$	0.17405	0.17906	0.00501	2.87848
	$U_2(t)$	0.3602	0.37978	0.01958	5.43587
	$W_1(t)$	0.12349	0.13774	0.01425	11.5394
	$W_2(t)$	0.10507	0.12578	0.02071	19.7107
0.20	$L_1(t)$	0.21541	0.22358	0.00817	3.79277
	$L_2(t)$	0.47537	0.51679	0.04142	8.71321
	$U_1(t)$	0.19379	0.20035	0.00656	3.38511
	$U_2(t)$	0.37834	0.40357	0.02523	6.6686
	$W_1(t)$	0.12351	0.13949	0.01598	12.9382
	$W_2(t)$	0.1047	0.12806	0.02336	22.3114

7. CONCLUSION

This paper deals with design and development of a novel and new queueing models with time and state dependent service rates having phase type service. This model is very useful for analyzing the communication network such as LAN, WAN, MAN, data voice transmission and other transformations during the peak time. Here, the service processes are characterized with non homogeneous Poisson processes. The direct arrival to the second queue has significant effect on congestion in first queue. The phase type service of allowing the intermediary leaving from first service station makes the model more effective and reduces the congestion in second queue. The system performance measures such as, the average number of customers in the queue and in the system, the average waiting time of customers in each queue and system, the throughput of service station and variability queue size distributions are derived explicitly. It is observed that the time and state dependent nature of the service processes has significant off influence on system performance measures. It is also possible to extend this paper with non- homogeneous arrivals which will be takes elsewhere.

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