



Examen Parcial

CURSO: Simulación de Sistemas.

GRUPO(s): G1

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FECHA: 07 de Mayo de 2012

HORA: 05:45 PM

DURACION DEL EXAMEN: 120 min

DEVOLUCION DEL EXAMEN CALIFICADO: En la clase de teoría

IMPORTANTE:

- El examen es sin copias ni apuntes.
- Está prohibido el préstamo de calculadoras, correctores, uso de celulares, consumo de bebidas, comidas y cigarrillos.

APELLIDOS Y NOMBRE:

CÓDIGO:

PREGUNTA 1 – Conceptos (7 Puntos)

- 1) Explique que es un evento discreto.
- 2) Explique que es el estado del sistema.
- 3) ¿Que es un periodo de calentamiento y en qué casos se requiere?
- 4) ¿Cuáles son las propiedades con las que deben cumplir los números aleatorios para ser considerados validos?
- 5) ¿Cuál es la diferencia entre el mecanismo del siguiente evento y el mecanismo de incremento fijo?
- 6) Indique los parámetros para obtener un generador de números aleatorios con un periodo mayor a 8000
- 7) Comente un jemplo para un sistema de estado estable.

PREGUNTA 2 – Generadores de variables aleatorias (3 Puntos)

Hallar el generador de variables aleatoria para la siguiente función:

$$f(x) = \begin{cases} \frac{1}{8} & 0 \leq x \leq 1 \\ \frac{2}{8} & 1 < x \leq 4 \\ \frac{1}{8} & 4 < x \leq 5 \end{cases}$$

i	1	2	3
r_i	0.12	0.52	0.84

Genere 3 valores aleatorios usando los números aleatorios del cuadro

PREGUNTA 3 – Simulación de Montecarlo (5 Puntos)

Suponga que queremos simular las ventas de un producto en un minimarket, el dueño adquiere para empezar el día 15 productos, la demanda diaria para los próximos 10 días son:

Demanda	3	4	5	6	7	8
Probabilidad	0.2	0.1	0.2	0.2	0.2	0.1

cada producto tiene un costo de \$6 y se vende a \$13, hay un costo de \$1 de mantener inventario por unidad de producto de un día para otro, si al final de un día en particular el dueño tiene menos de 8 productos en stock, ordena un pedido suficiente para tener 15 productos al inicio del siguiente día.

•Calcular la utilidad total para un periodo de 10 días

¿Cuántos productos sobran al final del último día?

Considerar la siguiente salida

Día	Productos al empezar el día	Demanda	Productos al final del día	Productos ordenados	Costo	Ingreso	Utilidad
1							
2							
3							
...							

PREGUNTA 4 – Pruebas de bondad de ajuste (5 Puntos)

Se tienen los “**TIEMPOS DE ARRIBOS**” de los requerimientos de ayuda al área de “Help Desk” de la empresa, nos piden determinar si el “**TIEMPOS ENTRE ARRIBOS**” puede ser expresado como una función exponencial, usar la prueba Chi cuadrado y un nivel de certeza del 95%

TIEMPOS DE ARRIBOS recolectados para el análisis:

Nro. Observacion	1	2	3	4	5	6	7	8	9	10	11	12
Tiempo de arribo	19	25	37	49	64	87	95	107	107	115	115	127

Nro. Observacion	13	14	15	16	17	18	19	20	21	22	23	24
Tiempo de arribo	132	160	167	190	207	225	229	234	234	238	242	242

Formulas útiles.

$$X_{n+1} \equiv (aX_n + c) \mod m$$

K = 1 + 3.3 Log (n)

$$\overline{X}(n) \pm t_{n-1,1-\alpha/2} \sqrt{\frac{S^2}{n}}$$

$$X=\mu+\sigma(\sum_{i=1}^{12}r_i-6)$$

X = - LN(1-r)/λ

X = a + r(b-a)

$$E(h)=\frac{2n-1}{3},\; V(h)=\frac{16n-29}{90},\; Z=\frac{h-E(h)}{\sqrt{V(h)}}$$

Tabla de distribucion T

Grados Libertad	0.1	0.05	0.01
	0.95	0.975	0.995
1	6.314	12.706	63.657
2	2.920	4.303	9.925
3	2.353	3.182	5.841
4	2.132	2.776	4.604
5	2.015	2.571	4.032
6	1.943	2.447	3.707
7	1.895	2.365	3.499
8	1.860	2.306	3.355
9	1.833	2.262	3.250
10	1.812	2.228	3.169
11	1.796	2.201	3.106
12	1.782	2.179	3.055
13	1.771	2.160	3.012
14	1.761	2.145	2.977
15	1.753	2.131	2.947
16	1.746	2.120	2.921
17	1.740	2.110	2.898
18	1.734	2.101	2.878
19	1.729	2.093	2.861
20	1.725	2.086	2.845
21	1.721	2.080	2.831
22	1.717	2.074	2.819
23	1.714	2.069	2.807
24	1.711	2.064	2.797
25	1.708	2.060	2.787
26	1.706	2.056	2.779
27	1.703	2.052	2.771
28	1.701	2.048	2.763
29	1.699	2.045	2.756
30	1.697	2.042	2.750
31	1.696	2.040	2.744
32	1.694	2.037	2.738
33	1.692	2.035	2.733
34	1.691	2.032	2.728
35	1.690	2.030	2.724
36	1.688	2.028	2.719
37	1.687	2.026	2.715
38	1.686	2.024	2.712
39	1.685	2.023	2.708
40	1.684	2.021	2.704
41	1.683	2.020	2.701
42	1.682	2.018	2.698
43	1.681	2.017	2.695
44	1.680	2.015	2.692
45	1.679	2.014	2.690
46	1.679	2.013	2.687

← α
 ← $1 - \alpha/2$

Tabla de distribucion Chi-Cuadrado

Grados	97.50%	5.00%	10.00%	2.50%	1.00%
Libertad	2.50%	95.00%	90.00%	97.50%	99.00%
1	0.0010	3.8415	2.7055	5.0239	6.6349
2	0.0506	5.9915	4.6052	7.3778	9.2103
3	0.2158	7.8147	6.2514	9.3484	11.3449
4	0.4844	9.4877	7.7794	11.1433	13.2767
5	0.8312	11.0705	9.2364	12.8325	15.0863
6	1.2373	12.5916	10.6446	14.4494	16.8119
7	1.6899	14.0671	12.0170	16.0128	18.4753
8	2.1797	15.5073	13.3616	17.5345	20.0902
9	2.7004	16.9190	14.6837	19.0228	21.6660
10	3.2470	18.3070	15.9872	20.4832	23.2093
11	3.8157	19.6751	17.2750	21.9200	24.7250
12	4.4038	21.0261	18.5493	23.3367	26.2170
13	5.0088	22.3620	19.8119	24.7356	27.6882
14	5.6287	23.6848	21.0641	26.1189	29.1412
15	6.2621	24.9958	22.3071	27.4884	30.5779
16	6.9077	26.2962	23.5418	28.8454	31.9999
17	7.5642	27.5871	24.7690	30.1910	33.4087
18	8.2307	28.8693	25.9894	31.5264	34.8053
19	8.9065	30.1435	27.2036	32.8523	36.1909
20	9.5908	31.4104	28.4120	34.1696	37.5662
21	10.2829	32.6706	29.6151	35.4789	38.9322
22	10.9823	33.9244	30.8133	36.7807	40.2894
23	11.6886	35.1725	32.0069	38.0756	41.6384
24	12.4012	36.4150	33.1962	39.3641	42.9798
25	13.1197	37.6525	34.3816	40.6465	44.3141
26	13.8439	38.8851	35.5632	41.9232	45.6417
27	14.5734	40.1133	36.7412	43.1945	46.9629
28	15.3079	41.3371	37.9159	44.4608	48.2782
29	16.0471	42.5570	39.0875	45.7223	49.5879
30	16.7908	43.7730	40.2560	46.9792	50.8922
40	24.4330	55.7585	51.8051	59.3417	63.6907
50	32.3574	67.5048	63.1671	71.4202	76.1539
60	40.4817	79.0819	74.3970	83.2977	88.3794
70	48.7576	90.5312	85.5270	95.0232	100.4252
80	57.1532	101.8795	96.5782	106.6286	112.3288
90	65.6466	113.1453	107.5650	118.1359	124.1163
100	74.2219	124.3421	118.4980	129.5612	135.8067

← α
← $1 - \alpha$

TABLA DE DISTRIBUCION NORMAL (Z positivo)

Zi	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.50000	0.50399	0.50798	0.51197	0.51595	0.51994	0.52392	0.5279	0.53188	0.53586
0.1	0.53983	0.5438	0.54776	0.55172	0.55567	0.55962	0.56356	0.56749	0.57142	0.57535
0.2	0.57926	0.58317	0.58706	0.59095	0.59483	0.59871	0.60257	0.60642	0.61026	0.61409
0.3	0.61791	0.62172	0.62552	0.6293	0.63307	0.63683	0.64058	0.64431	0.64803	0.65173
0.4	0.65542	0.6591	0.66276	0.6664	0.67003	0.67364	0.67724	0.68082	0.68439	0.68793
0.5	0.69146	0.69497	0.69847	0.70194	0.7054	0.70884	0.71226	0.71566	0.71904	0.7224
0.6	0.72575	0.72907	0.73237	0.73565	0.73891	0.74215	0.74537	0.74857	0.75175	0.7549
0.7	0.75804	0.76115	0.76424	0.7673	0.77035	0.77337	0.77637	0.77935	0.7823	0.78524
0.8	0.78814	0.79103	0.79389	0.79673	0.79955	0.80234	0.80511	0.80785	0.81057	0.81327
0.9	0.81594	0.81859	0.82121	0.82381	0.82639	0.82894	0.83147	0.83398	0.83646	0.83891
1.0	0.84134	0.84375	0.84614	0.84849	0.85083	0.85314	0.85543	0.85769	0.85993	0.86214
1.1	0.86433	0.8665	0.86864	0.87076	0.87286	0.87493	0.87698	0.879	0.881	0.88298
1.2	0.88493	0.88686	0.88877	0.89065	0.89251	0.89435	0.89617	0.89796	0.89973	0.90147
1.3	0.9032	0.9049	0.90658	0.90824	0.90988	0.91149	0.91308	0.91466	0.91621	0.91774
1.4	0.91924	0.92073	0.9222	0.92364	0.92507	0.92647	0.92785	0.92922	0.93056	0.93189
1.5	0.93319	0.93448	0.93574	0.93699	0.93822	0.93943	0.94062	0.94179	0.94295	0.94408
1.6	0.9452	0.9463	0.94738	0.94845	0.9495	0.95053	0.95154	0.95254	0.95352	0.95449
1.7	0.95543	0.95637	0.95728	0.95818	0.95907	0.95994	0.9608	0.96164	0.96246	0.96327
1.8	0.96407	0.96485	0.96562	0.96638	0.96712	0.96784	0.96856	0.96926	0.96995	0.97062
1.9	0.97128	0.97193	0.97257	0.9732	0.97381	0.97441	0.975	0.97558	0.97615	0.9767
2.0	0.97725	0.97778	0.97831	0.97882	0.97932	0.97982	0.9803	0.98077	0.98124	0.98169
2.1	0.98214	0.98257	0.983	0.98341	0.98382	0.98422	0.98461	0.985	0.98537	0.98574
2.2	0.9861	0.98645	0.98679	0.98713	0.98745	0.98778	0.98809	0.9884	0.9887	0.98899
2.3	0.98928	0.98956	0.98983	0.9901	0.99036	0.99061	0.99086	0.99111	0.99134	0.99158
2.4	0.9918	0.99202	0.99224	0.99245	0.99266	0.99286	0.99305	0.99324	0.99343	0.99361
2.5	0.99379	0.99396	0.99413	0.9943	0.99446	0.99461	0.99477	0.99492	0.99506	0.9952
2.6	0.99534	0.99547	0.9956	0.99573	0.99585	0.99598	0.99609	0.99621	0.99632	0.99643
2.7	0.99653	0.99664	0.99674	0.99683	0.99693	0.99702	0.99711	0.9972	0.99728	0.99736
2.8	0.99744	0.99752	0.9976	0.99767	0.99774	0.99781	0.99788	0.99795	0.99801	0.99807
2.9	0.99813	0.99819	0.99825	0.99831	0.99836	0.99841	0.99846	0.99851	0.99856	0.99861
3.0	0.99865	0.99869	0.99874	0.99878	0.99882	0.99886	0.99889	0.99893	0.99896	0.999
3.1	0.99903	0.99906	0.9991	0.99913	0.99916	0.99918	0.99921	0.99924	0.99926	0.99929
3.2	0.99931	0.99934	0.99936	0.99938	0.9994	0.99942	0.99944	0.99946	0.99948	0.9995
3.3	0.99952	0.99953	0.99955	0.99957	0.99958	0.9996	0.99961	0.99962	0.99964	0.99965

TABLA DE DISTRIBUCION NORMAL (Z negativo)

Zi	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.00034	0.00032	0.00031	0.0003	0.00029	0.00028	0.00027	0.00026	0.00025	0.00024
-3.3	0.00048	0.00047	0.00045	0.00043	0.00042	0.0004	0.00039	0.00038	0.00036	0.00035
-3.2	0.00069	0.00066	0.00064	0.00062	0.0006	0.00058	0.00056	0.00054	0.00052	0.0005
-3.1	0.00097	0.00094	0.0009	0.00087	0.00084	0.00082	0.00079	0.00076	0.00074	0.00071
-3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00104	0.001
-2.9	0.00187	0.00181	0.00175	0.00169	0.00164	0.00159	0.00154	0.00149	0.00144	0.00139
-2.8	0.00256	0.00248	0.0024	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193
-2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.0028	0.00272	0.00264
-2.6	0.00466	0.00453	0.0044	0.00427	0.00415	0.00402	0.00391	0.00379	0.00368	0.00357
-2.5	0.00621	0.00604	0.00587	0.0057	0.00554	0.00539	0.00523	0.00508	0.00494	0.0048
-2.4	0.0082	0.00798	0.00776	0.00755	0.00734	0.00714	0.00695	0.00676	0.00657	0.00639
-2.3	0.01072	0.01044	0.01017	0.0099	0.00964	0.00939	0.00914	0.00889	0.00866	0.00842
-2.2	0.0139	0.01355	0.01321	0.01287	0.01255	0.01222	0.01191	0.0116	0.0113	0.01101
-2.1	0.01786	0.01743	0.017	0.01659	0.01618	0.01578	0.01539	0.015	0.01463	0.01426
-2.0	0.02275	0.02222	0.02169	0.02118	0.02068	0.02018	0.0197	0.01923	0.01876	0.01831
-1.9	0.02872	0.02807	0.02743	0.0268	0.02619	0.02559	0.025	0.02442	0.02385	0.0233
-1.8	0.03593	0.03515	0.03438	0.03362	0.03288	0.03216	0.03144	0.03074	0.03005	0.02938
-1.7	0.04457	0.04363	0.04272	0.04182	0.04093	0.04006	0.0392	0.03836	0.03754	0.03673
-1.6	0.0548	0.0537	0.05262	0.05155	0.0505	0.04947	0.04846	0.04746	0.04648	0.04551
-1.5	0.06681	0.06552	0.06426	0.06301	0.06178	0.06057	0.05938	0.05821	0.05705	0.05592
-1.4	0.08076	0.07927	0.0778	0.07636	0.07493	0.07353	0.07215	0.07078	0.06944	0.06811
-1.3	0.0968	0.0951	0.09342	0.09176	0.09012	0.08851	0.08692	0.08534	0.08379	0.08226
-1.2	0.11507	0.11314	0.11123	0.10935	0.10749	0.10565	0.10383	0.10204	0.10027	0.09853
-1.1	0.13567	0.1335	0.13136	0.12924	0.12714	0.12507	0.12302	0.121	0.119	0.11702
-1.0	0.15866	0.15625	0.15386	0.15151	0.14917	0.14686	0.14457	0.14231	0.14007	0.13786
-0.9	0.18406	0.18141	0.17879	0.17619	0.17361	0.17106	0.16853	0.16602	0.16354	0.16109
-0.8	0.21186	0.20897	0.20611	0.20327	0.20045	0.19766	0.19489	0.19215	0.18943	0.18673
-0.7	0.24196	0.23885	0.23576	0.2327	0.22965	0.22663	0.22363	0.22065	0.2177	0.21476
-0.6	0.27425	0.27093	0.26763	0.26435	0.26109	0.25785	0.25463	0.25143	0.24825	0.2451
-0.5	0.30854	0.30503	0.30153	0.29806	0.2946	0.29116	0.28774	0.28434	0.28096	0.2776
-0.4	0.34458	0.3409	0.33724	0.3336	0.32997	0.32636	0.32276	0.31918	0.31561	0.31207
-0.3	0.38209	0.37828	0.37448	0.3707	0.36693	0.36317	0.35942	0.35569	0.35197	0.34827
-0.2	0.42074	0.41683	0.41294	0.40905	0.40517	0.40129	0.39743	0.39358	0.38974	0.38591
-0.1	0.46017	0.4562	0.45224	0.44828	0.44433	0.44038	0.43644	0.43251	0.42858	0.42465
0.0	0.5	0.49601	0.49202	0.48803	0.48405	0.48006	0.47608	0.4721	0.46812	0.46414