

บรรณานุกรม

การออกแบบและวิเคราะห์การทดลอง รศ.ดร. ประไพศรี สุทัศน์ ณ อยุธยา และ รศ. ดร. พงศ์ชนัน
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จุฬาลงกรณ์มหาวิทยาลัย

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ภาคผนวก

T table

cum. prob	t _{.50}	t _{.75}	t _{.90}	t _{.95}	t _{.99}	t _{.995}	t _{.9975}	t _{.999}	t _{.9995}	t _{.99975}	t _{.99995}
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.963
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
1000	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300
Z	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%	99.9%
	Confidence Level										

F distribution critical value landmarks table

		Degrees of freedom in numerator (df1)											
p		1	2	3	4	5	6	7	8	12	24	1000	
Degrees of freedom in denominator (df2)	1	0.100	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	60.71	62.00	63.30
		0.050	161.4	199.5	215.7	224.6	230.2	234.0	236.6	238.9	243.9	249.1	254.2
		0.025	647.8	799.5	864.2	899.6	921.8	937.1	948.2	956.6	976.7	997.3	1017.8
		0.010	4052	4999	5404	5624	5764	5859	5926	5961	6107	6234	6363
		0.001	405312	499725	540257	562668	576496	586033	593165	597954	610362	623703	636101
	2	0.100	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.41	9.45	9.49
		0.050	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.41	19.45	19.49
		0.025	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.41	39.46	39.50
		0.010	98.50	99.00	99.16	99.25	99.30	99.33	99.36	99.38	99.42	99.46	99.50
		0.001	998.38	998.84	999.31	999.31	999.31	999.31	999.31	999.31	999.31	999.31	999.31
	3	0.100	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.22	5.18	5.13
		0.050	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.74	8.64	8.53
		0.025	17.44	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.34	14.12	13.91
		0.010	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.05	26.60	26.14
		0.001	167.06	148.49	141.10	137.08	134.58	132.63	131.61	130.62	128.32	125.93	123.52
	4	0.100	4.54	4.32	4.19	4.11	4.05	4.01	3.96	3.95	3.90	3.83	3.76
		0.050	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	5.91	5.77	5.63
		0.025	12.22	10.65	9.98	9.60	9.36	9.20	9.07	8.96	8.75	8.51	8.26
		0.010	21.20	18.00	16.69	15.98	15.52	15.21	14.96	14.80	14.37	13.93	13.47
		0.001	74.13	61.25	56.17	53.43	51.72	50.52	49.65	49.00	47.41	45.77	44.09
	5	0.100	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.27	3.19	3.11
		0.050	6.61	5.79	5.41	5.19	5.05	4.95	4.86	4.82	4.68	4.53	4.37
		0.025	10.01	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.52	6.28	6.02
		0.010	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	9.89	9.47	9.03
		0.001	47.18	37.12	33.20	31.08	29.75	28.83	28.17	27.65	26.42	25.13	23.82
	6	0.100	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.90	2.82	2.72
		0.050	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.00	3.84	3.67
		0.025	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.37	5.12	4.86
		0.010	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.72	7.31	6.89
		0.001	35.51	27.00	23.71	21.92	20.60	20.03	19.46	19.03	17.99	16.90	15.77
	7	0.100	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.67	2.58	2.47
		0.050	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.57	3.41	3.23
		0.025	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.67	4.41	4.15
		0.010	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.47	6.07	5.66
		0.001	29.25	21.69	18.77	17.20	16.21	15.52	15.02	14.63	13.71	12.73	11.72
	8	0.100	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.50	2.40	2.30
		0.050	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.28	3.12	2.93
		0.025	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.20	3.95	3.68
		0.010	11.26	8.65	7.59	7.01	6.63	6.37	6.16	6.03	5.67	5.28	4.87
		0.001	25.41	18.49	15.83	14.39	13.46	12.86	12.40	12.05	11.19	10.30	9.36
	9	0.100	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.38	2.28	2.16
		0.050	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.07	2.90	2.71
		0.025	7.21	5.71	5.06	4.72	4.48	4.32	4.20	4.10	3.87	3.61	3.34
		0.010	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.11	4.73	4.32
		0.001	22.88	16.39	13.90	12.58	11.71	11.13	10.70	10.37	9.57	8.72	7.84

F distribution critical value landmarks table (Cont.)

		Degree of freedom in numerator (df1)										
	p	1	2	3	4	5	6	7	8	12	24	1000
		1	2	3	4	5	6	7	8	12	24	1000
Degrees of freedom in denominator (df2)	10	0.100	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.36	2.28	2.06
		0.050	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	2.91	2.54
		0.025	6.94	5.46	4.83	4.47	4.24	4.07	3.95	3.85	3.62	3.09
		0.010	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.71	3.92
		0.001	21.04	14.90	12.55	11.28	10.48	9.93	9.52	9.20	8.45	6.78
	12	0.100	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.15	1.91
		0.050	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.69	2.30
		0.025	6.55	5.10	4.47	4.12	3.89	3.73	3.61	3.51	3.28	2.73
		0.010	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.16	3.37
		0.001	18.64	12.97	10.80	9.63	8.89	8.36	8.00	7.71	7.06	5.44
	14	0.100	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.05	1.80
		0.050	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.53	2.14
		0.025	6.30	4.86	4.24	3.89	3.66	3.50	3.36	3.29	3.05	2.50
		0.010	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	3.80	3.02
		0.001	17.14	11.78	9.73	8.62	7.92	7.44	7.06	6.80	6.13	4.62
	16	0.100	3.05	2.67	2.46	2.33	2.24	2.18	2.13	2.09	1.99	1.72
		0.050	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.42	2.02
		0.025	6.12	4.69	4.08	3.73	3.50	3.34	3.22	3.12	2.89	2.32
		0.010	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.55	2.76
		0.001	16.12	10.97	9.01	7.94	7.27	6.80	6.46	6.20	5.55	4.09
	18	0.100	3.01	2.62	2.42	2.29	2.20	2.13	2.06	2.04	1.93	1.66
		0.050	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.34	1.92
		0.025	5.98	4.56	3.95	3.61	3.38	3.22	3.10	3.01	2.77	2.20
		0.010	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.37	2.58
		0.001	15.38	10.39	8.49	7.46	6.81	6.35	6.02	5.76	5.13	3.69
	20	0.100	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.89	1.61
		0.050	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.28	1.85
		0.025	5.87	4.46	3.86	3.51	3.29	3.13	3.01	2.91	2.68	2.09
		0.010	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.23	2.43
		0.001	14.82	9.95	8.10	7.10	6.46	6.02	5.69	5.44	4.82	3.40
	30	0.100	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.77	1.46
		0.050	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.09	1.63
		0.025	5.57	4.18	3.59	3.25	3.03	2.87	2.75	2.65	2.41	1.80
		0.010	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	2.84	2.02
		0.001	13.29	8.77	7.05	6.12	5.53	5.12	4.82	4.56	4.00	2.61
	50	0.100	2.81	2.41	2.20	2.06	1.97	1.90	1.84	1.80	1.68	1.33
		0.050	4.03	3.18	2.79	2.56	2.40	2.29	2.20	2.13	1.95	1.45
		0.025	5.34	3.97	3.39	3.05	2.83	2.67	2.55	2.46	2.22	1.56
		0.010	7.17	5.06	4.20	3.72	3.41	3.19	3.02	2.89	2.56	1.70
		0.001	12.22	7.96	6.34	5.46	4.90	4.51	4.22	4.00	3.44	2.05
	100	0.100	2.76	2.36	2.14	2.00	1.91	1.83	1.76	1.73	1.61	1.22
		0.050	3.94	3.09	2.70	2.46	2.31	2.19	2.10	2.03	1.85	1.30
		0.025	5.18	3.83	3.25	2.92	2.70	2.54	2.42	2.32	2.08	1.36
		0.010	6.90	4.82	3.98	3.51	3.21	2.99	2.82	2.69	2.37	1.45
		0.001	11.50	7.41	5.86	5.02	4.48	4.11	3.83	3.61	3.07	1.64
	1000	0.100	2.71	2.31	2.09	1.95	1.85	1.78	1.72	1.66	1.55	1.09
		0.050	3.85	3.00	2.61	2.38	2.22	2.11	2.02	1.95	1.76	1.11
		0.025	5.04	3.70	3.13	2.80	2.58	2.42	2.30	2.20	1.96	1.13
		0.010	6.66	4.63	3.80	3.34	3.04	2.82	2.66	2.53	2.20	1.16
		0.001	10.89	6.96	5.46	4.65	4.14	3.78	3.51	3.30	2.77	1.22

Use StatTable, WinPepi > Whatis, or other reliable software to determine specific p values

Z table

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990



ประวัติผู้เขียน

ชื่อ - สกุล

นายปิยะ เนยคำ

วัน เดือน ปี เกิด

23 ตุลาคม 2517

ประวัติการศึกษา

สำเร็จการศึกษามัธยมศึกษาตอนปลาย โรงเรียนหล่มเก่าวิทยาคม
ปีการศึกษา 2535

สำเร็จการศึกษาปริญญาตรี วิศวกรรมศาสตรบัณฑิต สาขาวิชาวิศวกรรมไฟฟ้า
มหาวิทยาลัยเชียงใหม่ ปีการศึกษา 2539

ประสบการณ์

ผู้จัดการทั่วไป แผนกวิศวกรรมการผลิต บริษัทโฮย่ากลาสติสค์
ประเทศไทย (จำกัด)

