Midterm Examination

May 1st, 2008

1. Classify the discontinuities in rock mass and list 6 properties of the discontinuities with brief explanation. (10)

Classification: Fault, Joint, Bedding, Cleavage, Fracture(Natural -), Artificial discontinuities.

Properties: Orientation, Size, Frequency, Surface geometry, Genetic type, Infill material.

2. Convert strike/dip to dip direction/dip. (10)

1) N20°E/66°SE → 110/66
2) N32°W/60°SW → 238/60
3) N40°E/30°NW → 310/30
4) N56°W/27°NE → 34/27

3. Compare the equal-angle projection with equal-area projection. (10)

4. Compare the BIPS with televiewer . (10)

5. Compare scanline survey with window sampling in terms of sampling bias. (10)

6. From a scanline whose trend and plunge are 40° and 0°, respectively, orientations of three joints are measured as below. (20)

Joint	Dip direction (α)	Dip (β)
1	230	86

2	247	78
3	65	80

When a cartesian coordinate system is adopted so that x, y and z axes are parallel to east, north and upward, respectively,

Joint	X	Y	Z
1	-0.764	-0.641	0.07
2	-0.9	-0.382	0.208
3	-0.893	-0.416	-0.174
Sum	-2.557	-1.439	0.104

1) Calculate the unweighted mean normal vector.
(-2.557, -1.439, 0.104) => <u>(-0.871, -0.491, 0.035)</u>

2) Calculate the weighted mean normal vector using Terzaghi correction.
scanline: (sin40, cos40, 0) = (0.643, 0.766, 0)
w1=1/cos theta1 =1 / |(-0.764, -0.641, 0.07)·(0.643, 0.766, 0)| = 1/0.982
w2=1/cos theta2 = |(-0.9, -0.382, 0.208)·(0.643, 0.766, 0)| = 1/0.871
w3=1/cos theta3 = |(0.893, 0.416, 0.174)·(0.643, 0.766, 0)| = 1/0.893
weighted sum: (-0.764, -0.641, 0.07)/0.982 + (-0.9, -0.382, 0.208)/0.871 - (0.893, 0.416, 0.174)/0.893 = (-2.811, -1.557, 0.115) => <u>(-0.874, -0.484, 0.036)</u>

7. Derive the Maximum Likelihood estimator of Fisher's K of generalized truncated Fisher distribution when the angle from the center (mean orientation) of poles to the set boundary is . (30)

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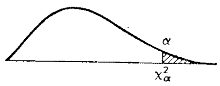
표 6. χ^2 분포표



d.f. \ α	.995	.990	.975	.950	.050	.025	.010	.005
1	392704×10^{-10}	157088×10^{-9}	982069×10^{-9}	393214×10^{-8}	3.84146	5.02389	6.63490	7.87944
2	.0100251	.0201007	.0506356	.102587	5.99147	7.37776	9.21034	10.5966
3	.0717212	.114832	.215795	.351846	7.81473	9.34840	11.3449	12.8381
4	.206990	.297110	.484419	.710721	9.48773	11.1433	13.2767	14.8602
5	.411740	.554300	.831211	1.145476	11.0705	12.8325	15.0863	16.7496
6	.675727	.872085	1.237347	1.63539	12.5916	14.4494	16.8119	18.5476
7	.989265	1.239043	1.68987	2.16735	14.0671	16.0128	18.4753	20.2777
8	1.344419	1.646482	2.17973	2.73264	15.5073	17.5346	20.0902	21.9550
9	1.734926	2.087912	2.70039	3.32511	16.9190	19.0228	21.6660	23.5893
10	2.15585	2.55821	3.24697	3.94030	18.3070	20.4831	23.2093	25.1882
11	2.60321	3.05347	3.81575	4.57481	19.6751	21.9200	24.7250	26.7569
12	3.07382	3.57056	4.40379	5.22603	21.0261	23.3367	26.2170	28.2995
13	3.56503	4.10691	5.00874	5.89186	22.3621	24.7356	27.6883	29.8194
14	4.07468	4.66043	5.62872	6.57063	23.6848	26.1190	29.1413	31.3193
15	4.60094	5.22935	6.26214	7.26094	24.9958	27.4884	30.5779	32.8013
16	5.14224	5.81221	6.90766	7.96164	26.2962	28.8454	31.9999	34.2672
17	5.69724	6.40776	7.56418	8.67176	27.5871	30.1910	33.4087	35.7185
18	6.26481	7.01491	8.23075	9.39046	28.8693	31.5264	34.8053	37.1564
19	6.84398	7.63273	8.90655	10.1170	30.1435	32.8523	36.1908	38.5822
20	7.43386	8.26040	9.59083	10.8508	31.4104	34.1696	37.5662	39.9968
21	8.03366	8.89720	10.28293	11.5913	32.6705	35.4789	38.9321	41.4010
22	8.64272	9.54249	10.9823	12.3380	33.9244	36.7807	40.2894	42.7956
23	9.26042	10.19567	11.6885	13.0905	35.1725	38.0757	41.6384	44.1813
24	9.88623	10.8564	12.4011	13.8484	36.4151	39.3641	42.9798	45.5585
25	10.5197	11.5240	13.1197	14.6114	37.6525	40.6465	44.3141	46.9278
26	11.1603	12.1981	13.8439	15.3791	38.8852	41.9232	45.6417	48.2899
27	11.8076	12.8786	14.5733	16.1513	40.1133	43.1944	46.9630	49.6449
28	12.4613	13.5648	15.3079	16.9279	41.3372	44.4607	48.2782	50.9933
29	13.1211	14.2565	16.0471	17.7083	42.5569	45.7222	49.5879	52.3356
30	13.7867	14.9535	16.7908	18.4926	43.7729	46.9792	50.8922	53.6720
40	20.7065	22.1643	24.4331	26.5093	55.7585	59.3417	63.6907	66.7659
50	27.9907	29.7067	32.3574	34.7642	67.5048	71.4202	76.1539	79.4900
60	35.5346	37.4848	40.4817	43.1879	79.0819	83.2976	88.3794	91.9517
70	43.2752	45.4418	48.7576	51.7393	90.5312	95.0231	100.425	104.215
80	51.1720	53.5400	57.1532	60.3915	101.879	106.629	112.329	116.321
90	59.1963	61.7541	65.6466	69.1260	113.145	118.136	124.116	128.299
100	67.3276	70.0648	74.2219	77.9295	124.342	129.561	135.807	140.169

Table A.4. Critical Values of D_n^α in the Kolmogorov-Smirnov Test (*After Hoel, 1962*)

n \ α	0.20	0.10	0.05	0.01
5	0.45	0.51	0.56	0.67
10	0.32	0.37	0.41	0.49
15	0.27	0.30	0.34	0.40
20	0.23	0.26	0.29	0.36
25	0.21	0.24	0.27	0.32
30	0.19	0.22	0.24	0.29
35	0.18	0.20	0.23	0.27
40	0.17	0.19	0.21	0.25
45	0.16	0.18	0.20	0.24
50	0.15	0.17	0.19	0.23
>50	$1.07/\sqrt{n}$	$1.22/\sqrt{n}$	$1.36/\sqrt{n}$	$1.63/\sqrt{n}$