Final Examination

June 12th, 2008

1. The orientation and normal linear frequencies of 3 joint sets are as shown in the following table. Obtain the trend and plunge of a scanline showing the least total linear frequency of joints as well as the least total linear frequency. (20)

Joint	Dip direction (α)	Dip (β)	Normal linear frequency (m^{-1})
1	230	86	2
2	247	78	3
3	65	80	1

2. The probability density function of the total spacing along a vertical scanline is a linearly decreasing function whose maximum total spacing is 6 m. Calculate the RQD from a rock core of 5m length. (25)

3. Show that the mean trace length is proportional to the second moment of joint diameter and is inversely proportional to the mean diameter when the joints are modeled as Poisson discs. (25)

4. Show that the following estimator is still applicable to the case where the maximum joint trace length is greater than the maximum observable length of a rectangular window (. (30)

1A. 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	Intersection	X	Y	Z
1	-0.764	-0.641	0.07	S12	-0.335	0.301	-0.893
2	-0.9	-0.382	0.208	S13	0.402	-0.556	-0.727
3	-0.893	-0.416	-0.174	S23	0.407	-0.909	0.088

-The least total linear frequency will be obtained by one of the three joint intersection vectors:

$\times$, $\times$ and $\times$

-cos θ:

J1-S12: 0.0, J2-S12: 0.0, J3-S12: 0.329 -> <u>= 1x0.329 = 0.329 m^{-1}</u>

J2-S13: 0.301 -> = 3x0.301 = 0.903 m^{-1}

J1-S23: 0.244 -> = 2x0.244 = 0.488 m^{-1}

- Trend/plunge of (-0.335, 0.301, -0.893):

sinP = -Z, P = Asin(-Z), T = Asin(X/cosP)

<u>Plunge = 63.25°, Trend = -48.1° = 311.9°</u>

2A.

- PDF of spacing x:

Complete function: y = (-x + 6)/18 at 0 ~ 6 m

Curtailed function: y = (-x + 6)/17.5 at 0 ~ 5 m

-Mean spacing:

-Total frequency = 1/ =0.525 m^{-1}

3A.

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Which makes .

When is combined with above relation we can get

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4A.

$N_l^c = \lambda_a A_l^c f(l)\, dl$

therefore, $N_{all}^c = \int_0^{lx} N_l^c = \lambda_a \int_0^{lx} A_l^c f(l)\, dl.$

Putting $A_l^c = \cos\theta \sin\theta\, l^2 - (W\sin\theta + H\cos\theta)\, l + WH$ to above,

The same process is applied to transecting traces for as follows.

$N_l^t = \lambda_a A_l^t f(l)\, dl$

When $\geq$

$N_l^t = \lambda_a A_l^t f(l)\, dl,$

For $\geq$

Now can be expressed as

Which can be rewritten with respect to as below