University of Asia Pacific
Department of Civil Engineering
Final Examination Spring 2013
Program: B. Sc. Engineering (Civil)

Course Title: Surveying | Credit Hours: 4.0 | Course Code: CE 105
Time: 3 hours | Full Marks: 100

SECTION I

(There are **Four** questions in this section. Answer any **Three** of them)

1. (a) Determine the azimuth and altitude of a star from following data: $(6\frac{2}{3})$

i. Declination of a star = 21°30′ N
ii. Hour Angle of a star = 40°
iii. Latitude of the observer = 50° N

(b) Calculate the earthwork for an embankment using the following data applying Prismoidal correction: (10)

Chainage (ft)	0	100	200	300
Ground Level (ft)	8.4	14	20.4	20
Formation Level (ft)	15	15	15	15

Formation level width = 100 ft. Side slope = 2 horizontal to 1 vertical

2.(a) Define "*Relief Displacement*". Derive an expression for relief displacement. $(4\frac{2}{3})$

(b) Compare between *Horizon System* and *Independent Equatorial System* with neat sketch. (2)

(c) A tacheometer fitted with an anallatic lens was set up at A. The following observations were made on a vertically held staff: (10)

Instrument Station	Staff Point	Whole Circle Bearing	Vertical Angle, Θ	Reading		
A	X	45°30′	0	3	3.625	4.25
A	P	32°30′	-2 °30′	2.25	3.75	5.25
A	Q	212°30′	+ 3°30′	1.2	3.25	5.3

R.L. of X is 36 ft. AX = 100 ft.(horizontal distance)

Determine the following:

i. Tacheometric constants.
ii. R.L. of P & Q.
iii. Horizontal distance between P & Q.

3. (a)Define " Picture Plane" and "Principal Point" with respect to terrestrial photogrammetry with a neat sketch. (3)

(b) The ground length of a line AB is known to be 550 m and the elevations of A and B are respectively 500 m and 300 m above mean sea level. On a vertical photograph taken with a camera having focal length of 20 cm include the images a and b of these points, and their photographic co-ordinates are :

$x_a = +2.65$ c.m. ,$y_a = +1.36$ c.m.
$x_b = -1.92$ c.m. ,$y_b = +3.65$ c.m.

The distance ab scaled directly from the photograph is 5.20 c.m. Compute the flying height above the mean sea level. (10)

(c) A line AB, 4000 m long lying at an elevation of 500 m measures 10 cm on a vertical photograph for which focal length is 20 cm. Determine the scale of the photograph in an area the average elevation of which is 900 m. $(3\frac{2}{3})$

4.(a) Why curvature correction is required for calculating volume using prismoidal and trapezoidal formulae ? Derive an expression for curvature correction applying Pappus' theorem. $(5\frac{2}{3})$

(b) Find the shortest distance between two places A and B , given that the latitude of A and B are 23.5° N and their longitudes are respectively 120°W and 70°E .Find also the direction of B on the great circle route. (11)

SECTION II

(There are **Five** questions in this section. Answer any **Four** of them)

1. (a) Explain how will you continue chaining past the following obstacles: (5)
   i. a hill
   ii. a river

   (b) The following bearings were observed with a compass. Calculate the interior angles. (7.5)

Line	Fore Bearing
AB	60°30′
BC	122°0′
CD	46°0′
DE	205°30′
EA	300°0′

2. (a) Explain the "closing error" of a compass survey. Show how you can adjust it by Graphical Method. (2+6)

   (b) The true bearing of a tower as observed from a station A is 348°38′ and the magnetic bearing of the tower as observed by a theodolite is 2°15′. The magnetic bearing of the line AB is also observed with the same instrument and found to be 148°26′. What is the true bearing of the line AB? (4.5)

3. (a) For a simple circular curve, define (4)
   i. Tangent distance
   ii. Deflection angle
   iii. Mid ordinate
   iv. Long chord

   (b) The following staff readings were observed successively with level, the instrument having being moved forward after the second, fourth and eighth readings:
   0.875, 1.235, 2.310, 1.385, 2.930, 3.125, 4.125, 0.120, 1.875, 2.030, 3.765
   The first reading was taken with the staff held upon a benchmark of elevation 132.135m. Enter the above readings in a page of a level book and calculate the R.L. of the points. Apply the necessary checks. (8.5)

4. (a) What is contour? What are the uses of contour maps? (1+2)
   (b) Draw contour maps: (1.5)
   i. an overhanging cliff
   ii. a pond
   iii. a ridge
   (c) What are the working operations of Plane Table Surveying? (3)
   (d) Derive curve setting out method by ordinates from the long chord (with figure). (5)

5. (a) What is local attraction? How it is detected and eliminated? (2.5)
(b) A street bend which deflects 33° is to be designed for a maximum speed of 27 mile per hour, a maximum centrifugal ratio of 0.25, width of road 9 ft and longitudinal gradient 40. The curve consisting of a circular arc combined with two transition curves. Calculate:
   i. The radius of the circular arc (2)
   ii. Length of transition curve (2)
   iii. Total length of the combined curve (3)
   iv. The chainage of the beginning and the end of the transition curve if the chainage of the P.I is 2554 m. (3)

Necessary Formulas for Spherical Triangle

1. $\cos P = \dfrac{\cos p - \cos a * \cos b}{\sin a * \sin b}$

2. $\tan(A+B)/2 = \cot(P/2) * \dfrac{\cos(a-b)/2}{\cos(a+b)/2}$

3. $\tan(A-B)/2 = \cot(P/2) * \dfrac{\sin(a-b)/2}{\sin(a+b)/2}$

Necessary Formulas for Curve Setting

1. Spiral angle, $S_a = (L_t/2\pi R)*180°$
2. Length of Transition curve, $L_t = hN$
3. Length of Circular curve, $L_c = (\pi R/180)*(\Delta - 2s_a)$
4. Length of Tangent, $L = (R+S)\tan(\Delta/2) + (L_t/2)$
5. Shift, $S = (L_t^2/24R)$

Note: Here the symbols have their usual meanings.