THE HONG KONG POLYTECHNIC UNIVERSITY

DEPARTMENT OF LAND SURVEYING AND GEO-INFORMATICS

Programme	:	MSc/PgD in Geomatics (34081 & 34082) MSc/PgD in Urban Informatics & Smart Cities (34083)

Subject Title	:	Spatial Data Acquisition			
Subject Code	:	LSGI522	**Session**	:	Semester 1, 2022/23
Date	:	7 December 2022	**Time**	:	19:00 - 22:00
Time Allowed	:	3 hours	**Subject Examiner(s)**	:	Wei Yao, (LSGI)

This question paper has a total of __4__ pages.

Instructions to Candidates: ~~This is a take-home exam~~.

This paper has SEVEN questions.

Answer **ALL** questions

Total marks = 40.

Available from Invigilator: Nil

DO NOT TURN OVER THE PAGE UNTIL YOU ARE TOLD TO DO SO

Question 1

(a)   Draw clear and accurate diagrams that illustrate that the coplanarity condition in photogrammetry can be represented by two instances of the collinearity condition.
          (5 marks)

(b)   List at least 5 differences between output usefulness of LiDAR and Photogrammetry as a data source for topographic mapping   (3 marks)

Question 2

Explain the following terms with an aid of diagram:

(a)   Geodetic and geocentric latitude   (2 marks)

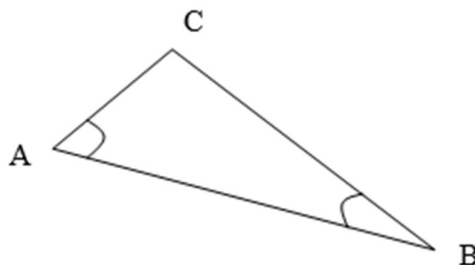(b)   For a prolate spheroid: meridional radius and prime vertical radius   (2 marks)

Question 3

Refer to the following diagram and given data, what are the coordinates of C?   (5 marks)

Given: Coordinates of **A** = (725.10, 301.75)
          Coordinates of **B** = (957.85, 258.40)
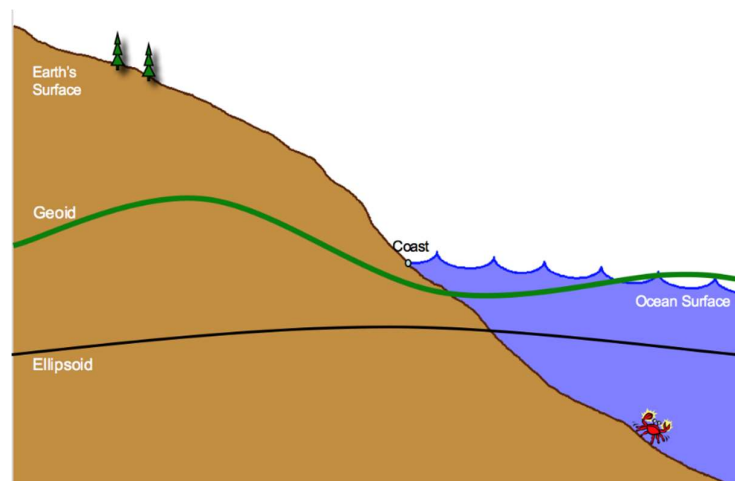   Angle **A** = 59° 30′ 48″
          Angle **B** = 32° 22′ 40″

Question 4

(a)   Suggest a set of projection equations for parameters (r=, h=, k=, p=, ω=), which could create an azimuthal projection with a property of equivalence   (2 marks)

(b)   Create a table of values for r, h, k, p, ω at latitudes 0 , 30, 45, 60 , 90 (degree) and comment on the distortion   (2 marks)

Question 5

(a)   What are the three segments of GPS and what are their functions? Show how they interact with each other using a diagram.   (3 marks)

(b)   What heights do GPS, Leveling, Gravimeters (Gravity) and Satellite Altimetry measure in general sense?   (4 marks)

(c)   Make use of following image as a reference in the answer sheet to mark these heights.
                                    (2 marks)

Question 6

(a)   Explain the difference between the terms GPS and GNSS.   (2 marks)

(b)   In the GPS system, the positioning codes are phase modulated onto the L1 and L2 carrier waves. Explain the principle of phase modulation.   (2 marks)

Question 7

The area for an aerial photogrammetric mapping project is 6.8 kilometers long and 4.6 kilometers wide. The photographic scale is 1:15,000. Calculate the minimum number of photographs (size of each photograph is 25 cm by 25 cm) that will be needed to provide stereoscopic coverage of the area if the photographs are to have 80% end-lap and 40% side-lap.   (6 marks)

- END OF PAPER -