THE HONG KONG POLYTECHNIC UNIVERSITY

DEPARTMENT OF LAND SURVEYING AND GEO-INFORMATICS

Programme	**:**	04001 MSc/PgD in Geomatics (Geographic Information Systems/Surveying)			
Subject Title	**:**	Spatial Data Acquisition			
Subject Code	**:**	LSGI522	**Session**	**:**	Semester 1, 2021/22
Date	**:**	3 December 2021	**Time**	**:**	19:00 – 22:00
Time Allowed	**:**	3 hours	**Subject Examiner(s)**	**:**	Dr. Wei Yao (LSGI)

This question paper has a total of __5__ pages.

Instructions to Candidates: **This is a take-home examination.**

This paper has **SEVEN** questions.

Answer **ALL** questions.

Questions carry marks as indicated.

Total marks = 40

Available from Invigilator: Nil

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

Question 1

(a) Distinguish the operation principles of Airborne Laser Scanning (ALS), Mobile Laser Scanning (MLS) and Terrestrial Laser Scanning (TLS) (3marks)
(b) State 5 differences between LiDAR and Photogrammetry (1.5 marks)
(c) List 6 applications of LiDAR (1.5 marks)

Question 2

Explain the following terms with an aid of diagram:

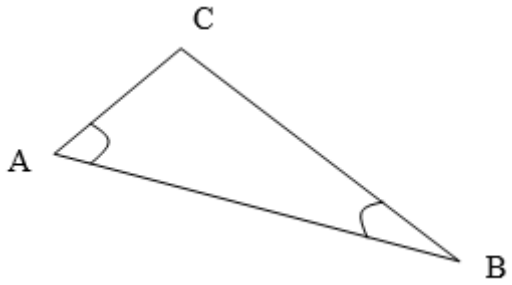
(a) Geodetic and geocentric latitude (1 mark)
(b) The geoid and ellipsoid (1 mark)
(c) For a prolate spheroid: meridional radius and prime vertical radius (2 marks)

Question 3

Refer to the following diagram and given data, what are the coordinates of C?

(7 marks)

Given: Coordinates of **A** = (2589.40, 6717.85)
Coordinates of **B** = (4717.77, 5625.10)
Angle **A** = 63˚ 40′ 28″
Angle **B** = 42˚ 02′ 04″



Question 4

Refer to the Figure (1) and answer the following questions:

(a) Define the term - map scale. (1 mark)
(b) What kind of map projection does Figure (1) use? What is the parametric equation of this projection? (3 marks)
(c) What are the characteristics of this projection? (1 mark)
(d) Suggest a name for Figure (1). (1 mark)
(e) What are the red dots in the Figure (1)? What are the indications of these dots? (1 mark)

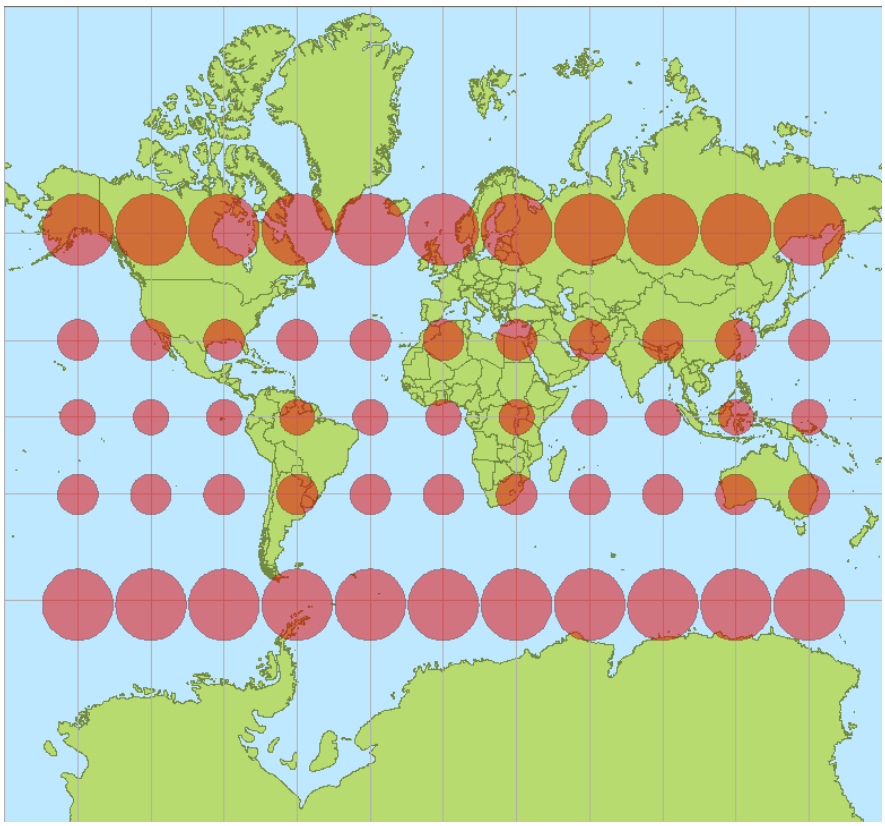


Figure (1)

Question 5

(a) What is Traversing? List TWO instruments have to deploy for traversing. (1 mark)
(b) With an aid of the diagrams, explain what are **Closed Link Traverse** and **Close Loop Traverse**. How many survey control points are needed for both traverses? Why? (3 marks)
(c) Why open traverse is always not encouraged? (1 mark)
(d) List the steps involved in manual traverse computation. (1 mark)

Question 6

Assume you have two satellites (a, b) and two receivers (q, r) and one epoch (t_1).

(a) State the four types of the GPS differencing. (2 marks)

(b) Refer to the GPS surveying configuration shown in Figure (2), determine the number of differences that can be done respectively for each type of GPS differencing? (2 marks)

(c) What kind of errors could be eliminated by each type of GPS differencing. (2 marks)

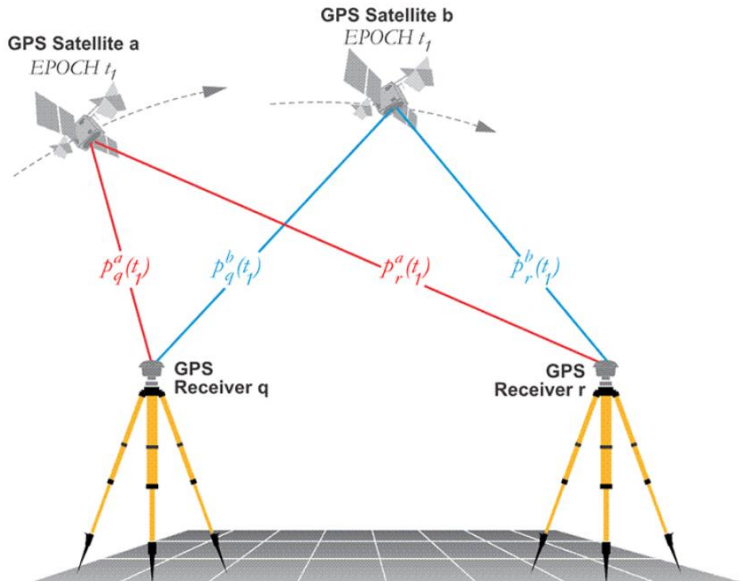


Figure (2)

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Question 7

Truth

Predicted	Asphalt	Concrete	Grass	Tree	Building
Asphalt	3720	1	0	2	0
Concrete	9	400	1	1	1
Grass	3	0	999	8	7
Tree	4	0	8	855	0
Building	10	11	0	8	2411

Confusion matrix of land cover classification

Calculate the following items, you are required to present the intermediate steps of your calculation.

(a) The Producer accuracy and User Accuracy of each class (2 marks)
(b) The Overall accuracy (1 mark)
(c) The Kappa coefficient (1 mark)

- END OF PAPER -