



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 5 Examination in Engineering: August 2015

Module Number: CE5233

Module Name: Advanced Surveying (O/C)

[Three Hours]

[Answer all questions. Each question carries **TWELVE** marks]

You may use equations given at the end of this paper with standard notations

- Q1. a) Define the following terms
- International date line
 - Co-Latitude
 - Greenwich hour angle

[3.0 Marks]

- b) You are in Bangkok airport and need to go to Galle as early as possible. There is a Singapore airline flight to Katunayake, and a Sri Lankan airline flight to Mattala. You have two options to go to Galle. One, to go to Katunayake and take a taxi, or go to Mattala and take a taxi to Galle. Based on the information given below evaluate the best option.

Departure time of Singapore Airline flight : 09:00 hrs

Departure time of Sri Lankan airline flight : 10:00 hrs

Time taken to go to Galle from Katunayake : 3 hrs

Time taken to go to Galle from Mattala : 4 hrs

Mattala (coordinates) : 6.1238° N , 81.12053° E

Bangkok (coordinates) : 13.7279° N , 100.5241° E

Katunayake(coordinates) : 7.1729N , 79.8849E

Radius of Earth : 6371 km

Average speed of the Singapore airline aircraft : 800 km/hr

Average speed of the Sri Lankan airlines aircraft : 750 km/hr

(you can assume that custom and immigration delays are the same at both Katunayake and Mattala)

[9.0 Marks]

- Q2. a) Assume that you are a planning engineer of a solid waste management project for a newly developed city with 80,000 population. Your basic two objectives are to plan the solid waste collection plan and to locate a sanitary landfill for final disposal. Briefly explain how you can use GIS technology to achieve those objectives? Consider following facts into your plan.

- Locations of Waste Bins
- Possible Routes for the waste collection
- Location of the sanitary landfill (at least 500m away from water resources and flood hazard areas)

Clearly mention about data and nature of GIS data you may use and how you may integrate those data in the GIS to achieve your objectives. It is not necessary to mention about particular GIS software and only explain about common GIS facilities which can be used to plan this project. Write down any assumption you made to build up your answer

[5.0 Marks]

b) Software is the one of the key components of a GIS. Discuss briefly Software as one component of GIS. List out other key component of a GIS.

[3.0 Marks]

c) What is meant by "Spatial data" and "Attributes data" in GIS? What are the main component of Spatial data?

[2.0 Marks]

d) Briefly discuss on "Continuous" and "Discrete" data in a GIS database. You may use simple figures to explain them.

[2.0 Marks]

Q3. a) Geographic Information Systems (GIS) should be much more than a Map. Explain this idea with examples.

[3.0 Marks]

b) State the advantages and limitations of satellite remote sensing over other methods of data collection.

[3.0 Marks]

c) "Electromagnetic Distance Measurement (EDM) technique is much better in distance measurements compare to traditional techniques. Rationalize this expression.

[3.0 Marks]

d) The measuring accuracy of all EDM equipment is specified in manufacturers' literature as $\pm(3mm + 3ppm)$. What is the expected accuracy when measuring a 500 m length?

[3.0 Marks]

Q4. Two Electromagnetic waves with wave length of λ_1 and λ_2 meters ($\lambda_1 > \lambda_2$) were sent from an EDM instrument. After being refracted from a prism refractor at a distance D the two waves recorded phase shifts of ϕ_1 and ϕ_2 respectively. It can be shown that when $\phi_1 > \phi_2$ number of full cycles made by the two waves are equal ($n_1 = n_2$) and when $\phi_1 < \phi_2$ then $n_1 = n_2 + 1$.

a) Drive the equation for the distance D with respect to the above mentioned variables

[5.0 Marks]

b) An EDM distance measuring exercise using two waves have given following results.

Parameter	Wave 1	Wave 2
λ_i	10m	8m
ϕ_i	270°	13°

i. What is the maximum distance measurable using this set of waves?

ii. What is the distance measured in the above exercise?

[4.0 Marks]

c) Explain a method to find the additive constant error for a set of refractor and an EDM.

[3.0 Marks]

- Q5. a) Explain the meaning of the following terms in the context of satellite remote sensing.
- i. Sun Synchronous Satellite
 - ii. Geostationary Satellite
 - iii. Orbital plane
- [4.5 Marks]
- b) State the potential applications of remote sensing in the following areas;
- i. Agriculture
 - ii. Urban planning
 - iii. Natural hazard management
- [4.5 Marks]
- c) Visible spectral region and Near-Infrared spectral region are used extensively in remote sensing applications. Discuss the above statement giving examples.
- [3.0 Marks]