National Exams December 2014

04-Geom-B2
Satellite Navigation

3 Hours duration

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.

2. This is a CLOSED BOOK EXAM.

3. Candidate may use one of the calculators, the Casio or Sharp non-programmable models.

4. Each question is specified for its maximum marks in bracket.

5. Clarity and organization of the answer are important

10 Marks **QUESTION ONE**

Name the fully operational GNSS systems and the other GNSS systems being developed worldwide and summarize their current status.

10 Marks **QUESTION TWO**

Describe how the DOPs are calculated in single point positioning? (Include the measurement model, the clear definition of the individual DOPs, and the explanation of your notation in your answer).

10 Marks **QUESTION THREE**

Summarize the GPS modernization project.

15 Marks **QUESTION FOUR**

Mathematically construct the double differenced GPS measurements from the (L1 C/A) pseudo-ranges $\rho_A^j(t), \rho_B^j(t), \rho_A^k(t), \rho_B^k(t)$ between the station A and the station B, and between the satellite j and the satellite k at an instant t and briefly discuss how the systematic and random errors on GPS measurements are reduced, cancelled or increased in the double differencing process. (Include the measurement equations, different error terms and the explanation of your notation in your answer).

15 Marks **QUESTION FIVE**

Summarize the different GPS positioning concepts inclusive of static, kinematic, single point and relative positioning methods.

10 Marks **QUESTION SIX**

Describe the approach of relative static GPS positioning (also referred to as "Conventional Static Positioning") in geodetic control surveying.

10 Marks **QUESTION SEVEN**

What is the multipath error in GPS positioning? Summarize the measures that can reduce, even eliminate the multipath error.

CHOSE ONE OUT OF QUESTION EIFGHT AND NINE

20 Marks **QUESTION EIGHT**

Conceptually describe the PPP technique and the Network RTK technique, respectively.

20 Marks **QUESTION NINE**

Describe three different integration strategies (loosely-coupled, tightly-coupled and deeply-coupled) that are used in the GNSS-aided inertial integrated navigation in term of the data processing. (Include the sensors used and the application areas in your answer).

Question No	Marks	Comment
1	10	mandatory
2	10	mandatory
3	10	mandatory
4	15	mandatory
5	15	mandatory
6	10	mandatory
7	10	mandatory
8	20	Select one out of 8 & 9
9	20	
Sum	100	