National Exams December 2015

04-Geom-B1, Digital Terrain Modelling

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. An approved Casio or Sharp model calculator is permitted.

3. All questions constitute a complete exam paper total marks equals 100.

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Marks

6 1. How do the following influence the choice of a DEM sampling interval: (3 x 2 marks)
   a) terrain roughness,
   b) required surface accuracy,
   c) terrain slope?

9 2. What is the difference between a
   a) digital terrain model (DTM),
   b) a digital elevation model (DEM) and,
   c) a digital surface model (DSM)? (3 x 3 marks)

10 3. Define the following in the context of digital terrain modelling (5 x 2 marks)
   a) breaklines,
   b) spot heights,
   c) sampling interval,
   d) elevation data accuracy,
   e) contour interval.

15 4. Explain the merits of using the following methods/systems for DEM data generation: (5 x 3 marks)
   a) map digitization,
   b) ground surveys,
   c) aerial photogrammetric methods,
   d) satellite image-based methods,
   e) airborne Lidar.

15 5. What are the advantages/disadvantages of using regular grid versus irregular data distributions for a DEM in terms of: (3 x 5 marks)
   a) data volumes,
   b) accuracy of surface representation,
   c) contour generation?

5 6. Explain the steps that are used to create a triangular irregular network (TIN) when using the data in a DEM.

10 7. Explain how you could use a DEM for: (2 x 5 marks)
   a) generating a watershed boundary?
   b) determining a floodplain boundary?

5 8. What is the difference between filtering and smoothing in DEM data processing?

5 9. How and why is the method of Kriging used for the interpolation of DEM data?

5 10. Explain how you could mathematically locate and eliminate any blunders in a DEM?

10 11. How are digital elevation models used for: (2 x 5 marks)
a) orthophoto generation,
b) volume computation?

5 12. How is DSM data used to rectify digital satellite imagery?

100 marks Total