



SECOND SEMESTER EXAMINATION, 2018/2019 ACADEMIC SESSION

COURSE TITLE: **LASER SYETEMS & RADIO SCIENCE**
COURSE CODE: **SVG526**
TIME ALLOWED: **2 hours**

Instruction: This examination is in 3 sections, you are expected to answer question from all sections
You are to answer question 1 and any other 1 in section "A"
You are to answer any question from section "B"
Finally you are to answer all the questions in section "C" by stating either "True" or "False"

Section "A" (Laser Systems)

- 1(a) Write short notes on the following (use of requisite diagrams where applicable is advantageous):
- (i) Doppler Effect (3 Mks)
 - (ii) Interferometry (3 Mks)
 - (iii) LASER (3 Mks)
- 1(b) Make a comparison between the VLBI, SLR and DORIS systems (11 Mks)
- 2(a) Discuss extensively on the components, operating principle and applications of VLBI (10 Mks)
- 2(b) State (at least one) processing software and itemize the procedure for processing VLBI data (5 Mks)
- 3(a) Discuss extensively on the characteristics of Laser Beam (6 Mks)
- 3(b)
- (i) calculate the full angle divergence of an Argon (blue) Laser beam whose beam waist diameter is 1mm and its wavelength is $0.488\mu\text{m}$. (3 Mks)
 - (ii) If the diameter is reduced to 0.5mm, what would be the full angle divergence? (3 Mks)
 - (iii) Based on your results, what can you deduce? (2 Mks)

Section "B" (Radio Science)

- 4a) Discuss in details the operational theory of a LIDAR system with emphasis on Airborne LIDAR flight planning. (8 Mks)
- 4b) Discuss the components of a LIDAR system (5 Mks)
- 4c) Specify the typical accuracy obtainable from LIDAR mapping (2 Mks)
- 5(a) Discuss briefly on the types of RADAR systems (6 Mks)
- 5(b) Identify any 5 RADAR band and specify their usage (5 Mks)
- 5(c) Using an hierarchical diagram, classify RADAR according to their wave forms (4 Mks)

Section "C"

1. Lasers are classified according to safety purposes based on their potential to harm the human eye and skin. _____
2. Radar systems are not used for signature analysis and inverse scattering. _____
3. The DORIS system operates based on the Doppler effect. _____
4. The Ruby Laser was discovered in 1961 by Theodore Maiman. _____
5. Laser technology is often applied in video games. _____
6. Jamming of DORIS signals do not occur because the signals are properly synchronized. _____
7. The LAGEOS-1 and LAGEOS-2 are SLR satellites. _____
8. The LAGEOS-1 and LAGEOS-2 satellites are part of the DORIS space segment. _____
9. The DORIS system makes both Doppler and Synchronization measurements. _____
10. The DORIS makes only Doppler measurements. _____