



Menoufia University  
Faculty of Electronic Engineering  
Dept. of Electronics and Electrical Comm.  
2<sup>nd</sup> Term  
4<sup>th</sup> Year



Subject: Elective Course (6)  
Nano Technology  
Date: 2/6/2019  
Total Test Marks: 70 Marks  
Time Allowed: 3 Hours

*Answer as much as you can*

**Question One (25 Marks)**

**A) Write short notes about:** (10 Marks)

1. Plasmon and Plasmonics
2. Pulsed wave technological family
3. Quantum well, wire, and dot.
4. Defect size effect on nanostructures
5. Geometric diode and MIM diodes.

**B) State** the basic characteristics of terahertz wave, and **List** some of its applications. (10 Marks)

**C) Compare** between the Narrowband and Broadband detectors for continuous wave Terahertz technology. (5 Marks)

**Question Two (25 Marks)**

**A) Compare** between the operation principle of photovoltaic cells and nano-antenna for solar energy harvesting. (10 Marks)

**B)** Starting with the equation of motion of a free electron due to applied electric field, **Derive** the complex permittivity and conductivity of metal at THz frequencies. (10 Marks)

**C) Discuss** the Surface Plasmon Polariton phenomena and its effect on the dielectric constant of materials. (5 Marks)



**Question Three (20 Marks)**

- A) With the aid of simple drawing, **Discuss** the *top-down method* for the preparation of nanostructures. (10 Marks)
- B) Based on your reading, **Discuss** a subject in communication technologies indicating its importance, limitations and applications. (5 Marks)
- C) **Discuss** the differences between electromagnetic waves interaction with metals at the frequency bands. (5 Marks)

*Good Luke*

*Dr. Hend Abd EL-Azem Malaht*