ST MARY’S UNIVERSITY

TWICKENHAM, LONDON

BSc Degree Examination students registered for

Level **SIX**

Title: **Medical Physics**

Code: **APH6004**

Semester: **Resit**

Date: **4th****July 2019**

Time: **09:30-11:30 AM**

TIME ALLOWED: **2** HOURS

Answer **SECTION A** and **ONE of the other two sections** (B or C)

**Section A:**

**[60 marks]**

1. What is cancer radiotherapy? **[2 Marks]**
2. What is ionizing radiation? **[2 Marks]**
3. Is ionizing radiation biological hazardous? Explain your answer **[3 Marks]**
4. Explain the difference between γ-rays and X-rays **[2 Marks]**
5. By what is the photon absorption in human tissue determined? **[2 Marks]**
6. The attenuation of photons when travelling in a tissue shows an exponential decrease of number of photons with the distance from the incident surface.
7. What does a large value of the linear attenuation coefficient, μ, mean? **[1 Mark]**
8. What does the exponential nature of the attenuation mean? **[1 Mark]**
9. How is “radiation absorption defined”? **[1 Mark]**
10. What are the main damages caused by radiation absorption? **[2 Marks]**
11. Is the dose of radiation absorbed by the tissue directly or indirectly correlated to the energy of the particle beam? **[1 Mark]**
12. (a) Define “exposure” **[1 Mark]**

 (b) What is the SI unit of ionizing radiation exposure? **[1 Mark]**

1. What is the “percentage depth dose”? **[1 Mark]**
2. Write a 1 page essay on “The application of Near-Infrared Spectroscopy to the measurement of blood oxygenation in the human body via the use of multi-channel inertia measurement units” **[20 Marks]**
3. Write a 1 page essay on “Automatic segmentation and measure of the volume of pulmonary nodules in lung CT-scans” **[20 Marks]**

**Section B:**

**[40 marks]**

Write an essay (1 to 2 pages) on “Nuclear medicine imaging”

In particular discuss the following points:

* Different types of imaging detectors
* Nuclear medicine image acquisition
* Two classes of measurements of scanner performance

**Section C:**

**[40 marks]**

Write an essay (1 to 2 pages) on “The principles of Reflection Tomography and its limitations”

In particular discuss the following points:

* Describe the role of transducers and receivers and how the signal is propagated
* Describe the electric signal and the reflectivity of the object
* Describe the limits of reflection tomography

**END OF EXAMINATION**