**1. Optical coherence tomography (60%)**

a) Draw a diagram of a typical time-domain optical coherence tomography (OCT) system, label the major components, and briefly explain their functions.

b) OCT techniques were based on low time-coherence interferometry. Give one example of light sources used in OCT system. What is the center wavelength 0 and spectral bandwidth  of this light source? Explain how you will use 0 and  to calculate the axial resolution of the OCT system.

c) What are the major differences between Frequency-domain OCT (FD-OCT) and Time-domain OCT (TD-OCT)? What are the key advantages of FD-OCT over TD-OCT?

Ans:

**2. Photoacoustic tomography (20%)**

Describe the basic principle of the photoacoustic tomography.

Ans:

In a similar way to one-photon and two-photon microscopy where the radiative relaxation from a higher energy level to a lower energy level causes the system to have fluorescence , the photoacoustic effect causes a dissipation of heat from the system. Because photoacoustic takes into account the scattering of tissue, it can penetrate deeper than a confocal single or dual photon microscopy. The excitation of the tissue causes a volume expansion where the pressure of the wave propagation is mathematically proportional to an absorption coefficient and the local optical fluence.

Now, having briefly discussed the photoacoustic effect as a physical phenomenon the basic principles of photoacoustic compute tomography are

**3. Diffuse optical tomography (20%)**

Describe a potential clinical application of diffuse optical tomography.

Ans: