Multiple choice questions QUANTUM ELECTRONICS
by K Thyagarajan, Physics Department, IIT Delhi, New Delhi.

Module 3: Multiple choice questions:

1.   A nonlinear medium has the following refractive indices: at 1000 nm, n_o = 4.80, n_e = 6.25 and at 500 nm, n_o = 4.86 and n_e = 6.32. If this medium is used for birefringence phase matching then

     a) The fundamental will be ordinary (o) and second harmonic will be extraordinarily (e) polarized
     b) The fundamental will be e polarized and the second harmonic will be o-polarized
     c) Both fundamental and second harmonic will be o-polarized
     d) Both the fundamental and second harmonic will be e-polarized

2.   In a nonlinear crystal, phase matched SHG is observed with an efficiency of 2 % at a fundamental wavelength of 1000 nm. If the input wavelength is changed to 1001 nm, the efficiency drops to 1 %. The wavelength of the output second harmonic after the change of input wavelength is

     a) 500 nm
     b) 501 nm
     c) 500.5 nm
     d) 500.25 nm

3.   In a phase matched difference frequency generation setup an incident wave at 1000 nm and having a power of 1 W interacts with a wave at 1500 nm and having a power of 1 mW. If the power exiting at 1500 nm is 1.1 mW, the power exiting at the difference frequency would be

     a) 0.1 mW
     b) 0.05 mW
     c) 0.5 mW
     d) 1 mW

4.   Consider SHG in a periodically poled lithium niobate crystal with waves propagating along the *x*-axis. To use the periodic variation in d_{31}, the polarization states of ω and 2ω waves must be

     a) Both extraordinary waves
     b) Both ordinary waves
     c) ω to be extraordinary and 2ω to be ordinary
     d) ω to be ordinary and 2ω to be extraordinary

5.   Consider sum frequency generation with wavelengths of 2 μm and 1 μm. The wavelength of the generated wave will be

     a) 0.666 μm
     b) 3 μm
     c) 1 μm
     d) 0.333 μm

Answers of module 3 MCQs:

A1: [Ans (b)]

A2: [Ans (c)]

A3: [Ans: (b)]

A4: [Ans: (d)]

A5: [Ans: (a)]