

BIT Sindri
1st Mid-term examination – 2018
Semester 1 (First year)
Branch – Electrical Engineering
Paper – Physics 1
(Oscillation, waves and optics)

Time – 1 $\frac{1}{2}$ hours

Full Marks : 20

Answer five questions from group A and group B. Group A is compulsory.

Group A (Multiple choice questions)

Answer any four questions

1X4 = 4

Q.1

- (i) Two sources of light are said to be coherent if the waves produced by them have the same
(a) wavelength (b) amplitude (c) wavelength and a constant phase difference
(d) amplitude and the same wavelength
- (ii) The wavefront originating from a point source is called
(a) Cylindrical wavefront (b) Spherical wavefront (c) Circular wavefront (d) None of these
- (iii) Laser beam is not
(a) Monochromatic (b) Unidirectional (c) Coherent (d) Non-coherent
- (iv) The wavelength of He-Ne laser is
(a) 6943 Å (b) 6328 Å (c) 6534 Å (d) 6845 Å
- (v) In case of damped motion of a system most quick decay of any initial displacement without oscillation can be obtained when the damping in the system
(a) is very low (b) is very high (c) has some critical value (d) is absent
- (vi) A damped harmonic oscillator of natural frequency ν_0 is driven by harmonic force of frequency ν . Then, in the steady state the oscillator will oscillate with
(a) Frequency ν_0 only (b) Frequency ν only (c) Both the frequencies ν_0 and ν (d) Frequency $\nu \pm \nu_0$

Group B (Long answer questions)

Answer any four questions

4X4 = 16

- Q.2 What are damped oscillations? Derive and solve the differential equation of a damped harmonic oscillator. Find the condition for overdamped, critically damped and underdamped motions.
(d) amplitude and the same wavelength
- Q.3 What are forced vibrations? Derive and solve the differential equation of a forced harmonic oscillator. Obtain the condition of resonance.
(i) The wavefront originating from a point source is called
(a) Cylindrical wavefront (b) Spherical wavefront (c) Circular wavefront (d) None of these
(iii) Laser beam is not
(a) Monochromatic (b) Unidirectional (c) Coherent (d) Non-coherent
- Q.4 Differentiate between spontaneous emission and stimulated emission. Establish a relationship between Einstein's A and B coefficients.
- Q.5 Describe the construction and working of a three level Ruby laser with necessary diagrams.
(iv) The wavelength of He-Ne laser is
- Q.6 Derive an expression for the resultant intensity at a point due to superposition of two light waves. Find the conditions for maximum intensity and minimum intensity. Draw and explain intensity distribution curve.
(a) 6943 Å (b) 6328 Å (c) 6534 Å (d) 6845 Å
- Q.7 In case of damped motion of a system most quick decay of any initial displacement without oscillation can be obtained when the damping in the system
(a) is very low (b) is very high (c) has some critical value (d) is absent
- (vi) A damped harmonic oscillator of natural frequency ν_0 is driven by harmonic force of frequency ν . Then, in the steady state the oscillator will oscillate with
(a) Frequency ν_0 only (b) Frequency ν only (c) Both the frequencies ν_0 and ν (d) Frequency $\nu \pm \nu_0$

Group B (Long answer questions)

Answer any four questions

4X4 = 16

- Q.2 What are damped oscillations? Derive and solve the differential equation of a damped harmonic oscillator. Find the condition for overdamped, critically damped and underdamped motions.
(d) amplitude and the same wavelength
- Q.3 What are forced vibrations? Derive and solve the differential equation of a forced harmonic oscillator. Obtain the condition of resonance.