Enrollment No......................................

Faculty of Engineering
End Sem (Odd) Examination Dec-2019
EN3BS05 Engineering Physics
Programme: B.Tech.   Branch/Specialisation: All

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1   i.   Which of the following is not true for LASER?   **1**
      (a) Extremely intense light   (b) Perfectly monochromatic
      (c) Coherent   (d) Divergent

  ii.   The He-Ne laser emits the following wavelength (in Å):   **1**
      (a) 6943   (b) 1064   (c) 6328   (d) 1060

  iii.   In Newton's ring arrangement, the diameter of rings formed is proportional to: **1**
      (a) λ (b) $\sqrt{\lambda}$ (c) $\frac{1}{\sqrt{\lambda}}$ (d) $\frac{1}{\lambda}$

  iv.   In a grating if $(e+d) < 2\lambda$, then the maximum number of order will be: **1**
      (a) Greater than 3   (b) Less than 2
      (c) Equal to 0.5   (d) Less than 1 and greater than 2

  v.   Compton shift ($\Delta\lambda$) depends on: **1**
      (a) Incident wavelength   (b) Angle of scattering
      (c) Target Material   (d) Energy of incident light

  vi.   The packing density of body centered cube is   **1**
      (a) $\frac{\pi}{6}$ (b) $\frac{\sqrt{3}\,\pi}{8}$ (c) $\frac{\sqrt{2}\,\pi}{6}$ (d) $\frac{8}{\sqrt{3}\,\pi}$

  vii.   The reduced mass of two objects having masses m_1 and m_2 is: **1**
      (a) Less than m_1 and m_2 (b) Greater than m_1 and m_2 both
      (c) Between m_1 and m_2 (d) None of these

  viii.   If the external impressed force on the system is zero, the total momentum of the system is: **1**
      (a) Increases   (b) Decreases   (c) Remains constant   (d) None of these

ix. The walls of a hall built for music concerns should   **1**
(a) Amplify sound   (b) Reflect Sound
(c) Transmit Sound   (d) Absorb Sound

x. Super conductivity phenomenon was first observed by _____   **1**
(a) De-Broglie   (b) Schrodinger
(c) Kamerlingh Onnes   (d) Brewster

Q.2   i. A certain ruby laser emits 1.00 J pulses of light whose wavelength is 6940 Å. What is the minimum number of cr^{3+} ions in the ruby?   **2**

ii. What is the difference between the spontaneous and stimulated processes?   **3**

iii. Derive the relation between Einstein's coefficients and also write its outcomes to design a laser.   **5**

OR   iv. Explain He-Ne laser with working, energy levels and constructions.   **5**

Q.3   i. What is double refraction? A glass plate is to be used as a polariser. Find the angle of polarization for it and also find the angle of refraction. Given μ for the glass = 1.54.   **3**

ii. Describe and explain the formation of Newton's rings in reflected monochromatic light. Explain briefly why Newton's rings are circular.   **7**

OR   iii. Derive an expression for the intensity distribution due to Fraunhofer diffraction at a single slit and show that the intensity of the first subsidiary maximum is about 4.5% of that of the principal maximum.   **7**

Q.4   i. What is de-Broglie wavelength of an electron which has been accelerated from rest through a potential difference of 100 V?   **3**

ii. Solve the Schrodinger equation for one dimensional motion of a particle in a box of side L and show that its eigen value is inversely proportional to the square of side L.   **7**

OR   iii. Write short note on: **7**
(a) Packing fraction
(b) Heisenberg Uncertainty Principle

Q.5   Write short note on any two:
i. Elastic and inelastic collision   **5**

ii. Gravitational potential due to spherical shell at a point P outside the shell.   **5**

iii. Coriolis force with its application   **5**

Q.6   i. A Cinema hall has a volume of 7500 m^3. It is required to have reverberation time of 1.5 sec. What should be the total absorption in the hall?   **3**

ii. Explain Meissner's effect?   **7**

OR   iii. Discuss Type-I and Type-II superconductors in detail?   **7**

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Marking Scheme
EN3BS05 Engineering Physics

Q.1 i. Which of the following is not true for LASER? **1**
(d) Divergent

ii. The He-Ne laser emits the following wavelength (in Å): **1**
(c) 6328

iii. In Newton's ring arrangement, the diameter of rings formed is proportional to: **1**
(b) $\sqrt{\lambda}$

iv. In a grating if $(e+d) < 2\lambda$, then the maximum number of order will be: **1**
(b) Less than 2

v. Compton shift $(\Delta\lambda)$ depends on: **1**
(b) Angle of scattering

vi. The packing density of body centered cube is **1**
(b) $\frac{\sqrt{3}\,\pi}{8}$

vii. The reduced mass of two objects having masses m_1 and m_2 is: **1**
(a) Less than m_1 and m_2

viii. If the external impressed force on the system is zero, the total momentum of the system is: **1**
(c) Remains constant

ix. The walls of a hall built for music concerns should **1**
(d) Absorb Sound

x. Super conductivity phenomenon was first observed by _____ **1**
(c) Kamerlingh Onnes

Q.2 i. What is the minimum number of cr^{3+} ions in the ruby? **2**
Formula	1 mark
Complete solution	1 mark

ii. At least three difference b/w the spontaneous and stimulated processes **3**
1 mark for each (1 mark * 3)

iii. Relation between Einstein's coefficients — 4 marks **5**
Its outcomes to design a laser — 1 mark

OR iv. He-Ne laser **5**
Constructions	2 marks
Working	2 marks
Energy levels	1 mark

Q.3 i.
Double refraction	1 mark	**3**
Angle of polarization	1 mark	
Angle of refraction	1 mark	

ii.
Diagram	2 marks	**7**
Working	3 marks	
Why rings are circular	2 marks	

OR iii.
Diagram	1 mark	**7**
Expression for the intensity distribution	4 marks	
Ratio	2 marks	

Q.4 i. De-Broglie wavelength of an electron **3**
Formula	1 mark
Complete solution	2 marks

ii. Solve the Schrodinger equation for one dimensional motion **7**
Boundary condition with sketch	2 marks
Rest	5 marks

OR iii. Write short note on: **7**
(a) Packing fraction	3.5 marks
(b) Heisenberg Uncertainty Principle	3.5 marks

Q.5 Write short note on any two:
i.
Elastic collision	2.5 marks	**5**
Inelastic collision	2.5 marks	

ii. Gravitational potential due to spherical shell at a point P outside the shell. **5**
Diagram	1 mark
Rest	4 marks

iii.
Coriolis force	3 marks	**5**
Its application	2 marks	

Q.6 i. What should be the total absorption in the hall? **3**
Formula	1 mark
Rest	2 marks

ii.
Meissner's effect diagram	2 marks	**7**
Statement	1 mark	
Explanation	4 marks	

OR iii.
Type-I superconductors	3.5 marks	**7**
Type-II superconductors	3.5 marks	

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