Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Even) Examination May-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 atomic states has longest life time? **1**

(a) Excited state (b) Metastable state

(c) Intermediate state (c) Ground state

ii. Light is guided within the core of a step index fiber by **1**

(a) Refraction at the core-air interface

(b) Total internal reflection at the core-cladding interface

(c) Total internal reflection at the outer surface of the cladding

(d) Change in the speed of light within the core

iii. Newton's ring experiment is based on interference due to **1**

(a) Division of amplitude (b) Division of wavefront

(c) None of these (d) Combination of (a) and (b)

iv. A grating which would be more suitable for constructing a spectrometer for the visible and ultraviolet regions, should have **1**

(a) 100 lines/cm (b) 1000 lines/cm

(c) 10000 lines/cm (d) 10^6 lines/cm

v. De-Broglie wavelength of an electron which has been accelerated from rest through a potential difference of 100V is **1**

(a) 12.27 A^0 (b)1.227 A^0 (c) 15 A^0 (d)1.5 A^0

vi. The rest mass of a photon is **1**

(a) 0 (b) 1 (c) Negligible (d) None of these

vii. Inelastic collision is collision in which kinetic energy is **1**

(a) Conserved (b) Not conserved

(c) Increases (d) Decreases

P.T.O.

viii. Two perfectly elastic particles A and B of equal masses travelling along the line joining them with velocity 15 ms^{-1} and 10 ms^{-1} respectively collide. Their velocities after the elastic collision will be (in ms^{-1}) respectively **1**
(a) 20 and 5 (b) 10 and 15 (c) 5 and 20 (d) 0 and 25

ix. Superconductivity was first discovered in **1**
(a) Mercury (b) Gold (c) Platinum (d) Palladium

x. The walls of the auditorium built for music concerns should **1**
(a) Amplify sound (b) Reflect sound
(c) Transmit sound (d) Absorb sound

Q.2 i. Give any four merits of optical fiber communication system over conventional communication system. **2**

ii. A laser beam can be focussed on an area of $50x10^{-14}$ m^2. If laser radiates energy at the rate of 1 mW. Find the intensity of focussed beam and write its unit. **3**

iii. What is meant by acceptance angle for an optical fibre? Show that it is related to numerical aperture. **5**

OR iv. What are the essential requirements to produce a laser? How are these fulfilled in a He-Ne laser? **5**

Q.3 i. Give any two differences between ordinary ray and extra ordinary ray. **2**

ii. Light containing two wavelengths λ_1 and λ_2 fall normally on a plano-convex lens of radius of curvature R resting on a glass plate. If the n^{th} dark ring due to λ_1 coincides with the $(n+1)^{th}$ dark ring due to λ_2. Prove that the radius of the n^{th} dark ring of λ_1 is **3**

$$\sqrt{\frac{\lambda_1\lambda_2 R}{\lambda_1-\lambda_2}}$$

iii. Write a short note on: **5**
(a) Fresnel's biprism (b) Nicol Prism

OR iv. Obtain the expression for intensity distribution in the diffraction pattern of a plane diffraction grating and hence obtain the condition for principal maxima. **5**

Q.4 i. Give any two limitations of classical mechanics. **2**

ii. State Heisenberg's Uncertainty principle. Find the De-Broglie wavelength of a 1.0 mg grain of dirt blown by a wind of speed 20m/s. **3**

iii. Write short notes on: **5**
(a) Miller indices
(b) Statement and conclusions of Compton's effect

OR iv. Establish the one-dimensional Schrodinger wave equation for a infinite square well potential, and hence give the discrete energy levels that are available to the particle. **5**

Q.5 i. What are pseudo forces? Explain. **4**

ii. Explain Coriolis force. Give any two applications. **6**

OR iii. Write short notes on: **6**
(a) Concept of reduced mass
(b) Conservation of linear and angular momentum.

Q.6 i. Draw a plot showing the variation of electrical resistivity with temperature for **2**
(a) Normal conductor (b) Super conductor

ii. (a) Distinguish between Type-1 and Type-2 super conductors. **8**
(b) What is Reverberation time? Explain Sabine's formula.

OR iii. (a) What is the Meissner effect? How does it occur? **8**
(b) Write any four factors which should be kept in mind while designing a hall for a good accoustic.

******

Marking Scheme
EN3BS05 Engineering Physics

Q.1 i. Which of the following atomic states has longest life time? **1**
(c) Ground state

ii. Light is guided within the core of a step index fiber by **1**
(b) Total internal reflection at the core-cladding interface

iii. Newton's ring experiment is based on interference due to **1**
(a) Division of amplitude

iv. A grating which would be more suitable for constructing a spectrometer for the visible and ultraviolet regions, should have **1**
(c) 10000 lines/cm

v. De-Broglie wavelength of an electron which has been accelerated from rest through a potential difference of 100V is **1**
(b)1.227 A^0

vi. The rest mass of a photon is **1**
(a) 0

vii. Inelastic collision is collision in which kinetic energy is **1**
(b) Not conserved

viii. Two perfectly elastic particles A and B of equal masses travelling along the line joining them with velocity 15 ms^{-1} and 10 ms^{-1} respectively collide. Their velocities after the elastic collision will be (in ms^{-1}) respectively **1**
(b) 10 and 15

ix. Superconductivity was first discovered in **1**
(a) Mercury

x. The walls of the auditorium built for music concerns should **1**
(d) Absorb sound

Q.2 i. Any four merits of optical fiber communication system over conventional communication system **2**
0.5 mark for each merit (0.5 mark * 4)

ii. Find the intensity of focussed beam and write its unit. **3**
I=P/A Correct formula: 1 mark
= 2 x 10^9 W/m^2 Correct answer: 2 marks

iii. Acceptance angle for an optical fibre **5**
Definition of acceptance angle: 1 mark
Diagram: 1 mark
Derivation for relation: 3 marks

OR iv. Essential requirements to produce a laser: 1 mark **5**
He-Ne Laser Diagram: 1 mark
Energy level diagram: 1 mark
Explanation: 2 marks

Q.3 i. Any two differences between ordinary ray and extra ordinary ray **2**
1 mark for each difference (1 mark * 2)

ii. Prove that the radius of the n^{th} dark ring of λ_1 is **3**
$\sqrt{\frac{\lambda_1\lambda_2 R}{\lambda_1-\lambda_2}}$

We know that the radius of nth dark due to λ_1
$= \sqrt{n}\,\lambda_1 R$ (1)
The radius of (n+1)th dark ring due to λ_2
$= \sqrt{(n+1)}\,\lambda_2 R$ (2)
According to the problem, both are equal, hence
$r= \sqrt{n}\,\lambda_1 R=\sqrt{(n+1)}\,\lambda_2 R$
$n\,\lambda_1 R=(n+1)\,\lambda_2 R$
$n=\frac{\lambda 2}{\lambda 1-\lambda 2}$ (3)

from equation (3), substituting the value of n in eq.(1), We have
$r= \sqrt{n}\,\lambda_1 R$
$= \sqrt{\frac{\lambda_1\lambda_2 R}{\lambda_1-\lambda_2}}$

iii. Write a short note on: **5**
(a) Fresnel's biprism 2.5 marks
(b) Nicol Prism 2.5 marks

OR iv. Condition for principal maxima. **5**
Diagram: 1 mark
Condition for principle maxima: 4 marks

Q.4 i. Any two limitations of classical mechanics. **2**
1 mark for each limitation (1 mark * 2)

ii. Heisenberg's Uncertainty principle. 1 mark **3**
Find the De-Broglie wavelength of a 1.0 mg grain of dirt blown by a wind of speed 20m/s.
$\lambda = h/mv$
6.63×10^{-34} J-s/$((1.0 \times 10^{-6})(20$ m/s$))$
$= 3.315 \times 10^{-29}$ m 2 marks

	iii.	Write short notes on:		**5**
		(a) Miller indices	2.5 marks	
		(b) Statement of Compton's effect	1 mark	
		Conclusions of Compton's effect	1.5 marks	
OR	iv.	Establish the one-dimensional Schrodinger wave equation for a infinite square well potential, and hence give the discrete energy levels that are available to the particle.		**5**
		Diagram	1 mark	
		Derivation of wavelength	2 marks	
		Energy level	2 marks	
Q.5	i.	Pseudo forces		**4**
		Definition	1 mark	
		Explanation	3 marks	
	ii.	Coriolis force	2 marks	**6**
		Any two applications.2 marks for each (2 mark * 2)	4 marks	
OR	iii.	Write short notes on:		**6**
		(a) Concept of reduced mass	3 marks	
		(b) Conservation of linear	1.5 marks	
		Angular momentum.	1.5 marks	
Q.6	i.	Draw a plot showing the variation of electrical resistivity with temperature for		**2**
		(a) Normal conductor	1 mark	
		(b) Super conductor	1 mark	
	ii.	(a) Distinguish between Type-1 and Type-2 super conductors.	4 marks	**8**
		(b) Reverberation time	2 marks	
		Sabine's formula.	2 marks	
OR	iii.	(a) Meissner effect	1 mark	**8**
		Diagram	1 mark	
		Its occurrence	2 marks	
		(b) Any four factors which should be kept in mind while designing a hall for a good accoustic.		
		1 mark for each (1 mark * 4)	4 marks	

******