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

Enrollment No.....

Faculty of Science

End Sem (Odd) Examination Dec-2019

BC3CO12 Physics-III

Programme: B.Sc. (CS) Branch/Specialisation: Computer Science

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. Haidinge's fringes are- **1**

(a) Newton's ring (b) Michelson fringes

(c) Both (a) and (b) (c) None of these

ii. In Newton's ring experiment, circular rings are formed by- **1**

(a) Diffraction (b) Polarisation

(c) Division of Amplitude (d) Division of wave front

iii. The Radii of n^{th} half period zones are proportional to- **1**

(a) $n^{3/2}$ (b) n (c) $n^{1/2}$ (d) $n^{5/2}$

iv. Diffraction is possible – **1**

(a) Only in mechanical waves

(b) Only in electromagnetic waves

(c) Only in visible waves

(d) Both (a) and (b)

v. For calcite crystal – **1**

(a) $v_0 < v_e$ (b) $v_0 = v_e$ (c) $v_0 > v_e$ (d) $v_0 \neq v_e$

vi. The sunlight is incident on a glass plate of refractive index $\mu=\sqrt{3}$, the reflected wave is completely plane polarized for the angle of incidence is **1**

(a) 45˚ (b) 57˚ (c) 60˚ (d) 68˚

vii. The specific rotation of substance – **1**

(a) Depends on wavelength (b) Does not depend on wavelength

(c) Depends on the intensity (d) Is always equal to critical angle

P.T.O.

viii. Resolving power of a prism is- **1**
(a) tdμ (b) dμ/dλ (c) t(dμ/dλ) (d) t(dλ/ dμ)

ix. The true relation between the coherence length L and coherence time τ is- **1**
(a) $L = C/\tau$ (b) $L = \tau C$ (c) $L = \tau/ C$ (c) None of these

x. The ratio of Einstein coefficients A and B is proportional to **1**
(a) Third power of frequency (b) Square of frequency
(c) Not depend on frequency (c) None of these

Q.2 i. Can interference be seen in the transmitted white light from the air film formed between the two glass plates? Explain your answer with the reason. **3**

ii. Describe Michelson's interferometer. How will you use it to demonstrate that the sodium D line is really double? **7**

OR iii. Explain the theory and condition of interference and derive the expression of fringe width. **7**

Q.3 i. Explain the Fresnel half period zone in brief. **3**

ii. Distinguish between the Fresnel and Fraunhofer types of diffraction patterns. Investigate theoretically the Fraunhofer diffraction pattern due to double slit. **7**

OR iii. Described the construction and principle of a plane transmission grating and explain the formation of spectrum by it. How will you determine the wave length of light using it? **7**

Q.4 i. Explain polarization of electromagnetic waves. What conclusion is obtained about the nature of light by this phenomenon? **3**

ii. State and prove Malus law. **7**

OR iii. Describe the phenomenon of double refraction in uniaxial crystals. How is double refraction explained by Huygen's theory? **7**

Q.5 i. Calculate the least width that the grating must have to resolve two components of sodium D_1 (5890 Å) and D_2 (5896 Å) lines in the second order, the grating having 800 lines per cm. **4**

ii. Describe the construction of high power microscope and discuss the relation between its magnifying and resolving powers. **6**

OR iii. Write the difference between the resolving power telescope, grating and prism. **6**

Q.6 Attempt any two:

i. Write characteristics and applications of Laser light. **5**

ii. Write Einstein prediction and Einstein coefficients. **5**

iii. Write construction and working of He-Ne Laser. **5**

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Marking Scheme
BC3CO12 Physics-III

Q.1	i.	Haidinge's fringes are- (b) Michelson fringes		**1**
	ii.	In Newton's ring experiment, circular rings are formed by- (c) Division of Amplitude		**1**
	iii.	The Radii of n^{th} half period zones are proportional to- (c) $n^{1/2}$		**1**
	iv.	Diffraction is possible – (d) Both (a) and (b)		**1**
	v.	For calcite crystal – (a) $v_0 < v_e$		**1**
	vi.	The sunlight is incident on a glass plate of refractive index $\mu=\sqrt{3}$, the reflected wave is completely plane polarized for the angle of incidence is (c) 60˚		**1**
	vii.	The specific rotation of substance – (a) Depends on wavelength		**1**
	viii.	Resolving power of a prism is- (c) $t(d\mu/d\lambda)$		**1**
	ix.	The true relation between the coherence length L and coherence time τ is- (b) $L = \tau C$		**1**
	x.	The ratio of Einstein coefficients A and B is proportional to (a) Third power of frequency		**1**
Q.2	i.	Diagram	1 mark	**3**
		Reason	2 marks	
	ii.	Description of Michelson's interferometer	3 marks	**7**
		Diagram	2 marks	
		Application to determine the sodium D lines	2 marks	
OR	iii.	Theory of interference	2 marks	**7**
		Condition of interference	1 mark	
		Derivation of the expression of fringe width	4 marks	
Q.3	i.	Fresnel half period zone		**3**
	ii.	Difference b/w the Fresnel and Fraunhofer diffraction	3 marks	**7**
		Theory of Fraunhofer diffraction pattern due to double slit	4 marks	
OR	iii.	Construction of a plane transmission grating	2 marks	**7**
		Principle of a plane transmission grating	2 marks	
		Formation of spectrum by grating	1 mark	
		Determine the wave length of light using grating	2 marks	
Q.4	i.	Definition of polarization	1 mark	**3**
		Explanation of the nature of light	2 marks	
	ii.	Statement of Malus law	2 marks	**7**
		Proof of law	5 marks	
OR	iii.	Description of double refraction in uniaxial crystals	3 marks	**7**
		Explanation by Huygen's theory	4 marks	
Q.5	i.	Calculate the least width that the grating Stepwise marking		**4**
	ii.	Construction of high power microscope	3 marks	**6**
		Relation between its magnifying and resolving powers	3 marks	
OR	iii.	Difference b/w the resolving power telescope, grating and prism 1 mark for each difference	(1 mark * 6)	**6**
Q.6		Attempt any two:		
	i.	Characteristics of Laser light	2.5 marks	**5**
		Applications of Laser light	2.5 marks	
	ii.	Einstein prediction	2.5 marks	**5**
		Einstein coefficients	2.5 marks	
	iii.	Construction of He-Ne Laser	2.5 marks	**5**
		Working of He-Ne Laser	2.5 marks	

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