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

Enrollment No.....

Faculty of Science

End Sem (Odd) Examination Dec-2018

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. Two slits at a separation of 0.5 cm are illuminated with light of wavelength 5000 Å. The interference fringes are seen on a screen at a distance 1 m from the slit. The fringe width is: **1**

(a) 0.1 cm (b) 0.01 cm (c) 10 cm (d) 1 cm

ii. A Soap film appear coloured in white light because of: **1**

(a) Interference (b) Diffraction

(c) Dispersion (d) Reflection

iii. The incident wavefront to study Fraunhofer diffraction due to the single slit must be **1**

(a) Spherical (b) Plane (c) Cylindrical (d) None of these

iv. The intensity at central maxima due to diffraction from N slits when compared to the intensity at central maxima due to diffraction at a single slit is: **1**

(a) N times (b) N^2 times (c) Equal (d) Less

v. The incorrect statement regarding the ordinary and extra-ordinary rays in a uniaxial crystal is: **1**

(a) Both travel with different speed in all direction

(b) Both are plane polarised

(c) Both have spherical wavefronts

(d) Both have their plane of polarisation mutually perpendicular to each other.

P.T.O.

vi. By Brewster's law: **1**
(a) $\mu = \tan i_p$ (b) $i_p = \tan \mu$
(c) $i_p + r = \tan \mu$ (d) $i_p = 90^\circ$

vii. The expression for the resolving limit of telescope is: **1**
(a) λ/d (b) $1.22\,\lambda/d$ (c) d/λ (d) $d/1.22\lambda$

viii. On increasing the reflectivity of plates of Fabry-Perot etalon **1**
(a) Coefficient of sharpness decreases
(b) Magnifying power decreases
(c) Resolving power increases
(d) Resolving power decreases

ix. The wavelength of ruby laser is: **1**
(a) 6328 Å (b) 5000 Å (c) 6943 Å (d) 6000 Å

x. The pumping source in He-Ne laser is **1**
(a) Electrical discharge (b) Optical pumping
(c) Chemical reactions (d) None of these

Q.2 i. How is the fringe width affected if **3**
(a) Distance between two sources is reduced to half and the distance of screen from slit is doubled
(b) The experiment done in the water,
(c) The slit is covered first with a red cellophane paper and then with the blue?

ii. What is Fresnel's biprism? Describe an experiment to determine the wavelength of sodium light with biprism. Deduce the formula used. **7**

OR iii. Describe Michelson's interferometer and hence explain the formation of circular fringes. How will you use these fringes in determination of wavelength of monochromatic light? **7**

Q.3 i. What is the Rayleigh's criterion of just resolution? Explain. **3**

ii. Describe the construction and principle of a plane transmission grating and explain the formation of spectrum by it. How will you determine the wavelength of light using it? **7**

OR iii. What is the half zone plate? Explain the approximate rectilinear propagation of light by the half zone method. **7**

Q.4 i. What do you mean by Brewster's angle? State Brewster's law. **3**

ii. What is the double refraction? Explain the phenomenon of double refraction in uniaxial crystal on the basis of the Huygens' principle. Give the suitable example. **7**

OR iii. How will you detect that the given beam of light is unpolarised, plane polarised, partially plane polarised, circularly polarised or elliptically polarised? **7**

Q.5 i. Write down the expression for the resolving power of a grating. How can it be increased? **2**

ii. Show that the resolving power of the Fabry-Parot etalon is given by the relation R.P. = $4\pi t F/\lambda\sqrt{20}$, where the symbols have their usual meanings. **8**

OR iii. What do you understand by the terms optical rotation and specific rotation? Explain the construction and working of half shade polarimeter. **8**

Q.6 i. State the reason, why for the laser action, there should be minimum three energy states of atomic system. **3**

ii. Explain the construction and working of a Helium-Neon laser. Write two characteristic of the beam obtained from the Helium-Neon laser. **7**

OR iii. Explain the meaning of the Einstein's coefficient A and B and hence establish a relationship between them by the statistical mechanics. Write two uses of laser. **7**

******

Marking Scheme
BC3CO12 Physics-III

Q.1	i.	Two slits at a separation of 0.5 cm are illuminated with light of wavelength 5000 Å. The interference fringes are seen on a screen at a distance 1 m from the slit. The fringe width is: (b) 0.01 cm	**1**
	ii.	A Soap film appear coloured in white light because of: (a) Interference	**1**
	iii.	The incident wavefront to study Fraunhofer diffraction due to the single slit must be (b) Plane	**1**
	iv.	The intensity at central maxima due to diffraction from N slits when compared to the intensity at central maxima due to diffraction at a single slit is: (b) N^2 times	**1**
	v.	The incorrect statement regarding the ordinary and extra-ordinary rays in a uniaxial crystal is: (c) Both have spherical wavefronts	**1**
	vi.	By Brewster's law: (a) $\mu = \tan i_p$	**1**
	vii.	The expression for the resolving limit of telescope is: (d) $d/1.22\lambda$	**1**
	viii.	On increasing the reflectivity of plates of Fabry-Perot etalon (c) Resolving power increases	**1**
	ix.	The wavelength of ruby laser is: (c) 6943 Å	**1**
	x.	The pumping source in He-Ne laser is (a) Electrical discharge	**1**
Q.2	i.	How is the fringe width affected if (a) Distance between two sources is reduced to half and the distance of screen from slit is doubled — 1 mark (b) The experiment done in the water, — 1 mark (c) The slit is covered first with a red cellophane paper and then with the blue — 1 mark	**3**
	ii.	Fresnel's biprism — 2 marks	**7**
		Description of experiment — 4 marks	
		Deduce the formula used — 1 mark	
OR	iii.	Michelson's interferometer	**7**
		Diagram + description — 2 marks	
		Circular fringe explanation — 2 marks	
		Application in wavelength — 3 marks	
Q.3	i.	Rayleigh's criterion of just resolution	**3**
		Diagram — 1 mark	
		Explanation — 2 marks	
	ii.	Construction — 1 mark	**7**
		Principle — 2 marks	
		Formation of spectrum — 1 mark	
		Diagram — 1 mark	
		Determination — 2 marks	
OR	iii.	Half zone plate	**7**
		Definition + postulates — 3 marks	
		Diagram + explanation + equation — 4 marks	
Q.4	i.	Brewster's angle definition — 1 mark	**3**
		Statement — 2 marks	
	ii.	Double refraction — 2 marks	**7**
		Diagram — 1 mark	
		Explanation — 1 mark	
		Huygens' principle — 2 marks	
		Example — 1 mark	
OR	iii.	Unpolarised — 1 mark	**7**
		Plane polarised — 1 mark	
		Partially plane polarised — 2 marks	
		Circularly polarised — 2 marks	
		Elliptically polarised — 1 mark	
Q.5	i.	Expression for the resolving power of a grating — 1 mark	**2**
		Explanation — 1 mark	
	ii.	Diagram and intensity relation — 2 marks	**8**
		R. P. derivation — 4 marks	
		Expression — 2 marks	

OR	iii.	Optical rotation	2 marks	**8**
		Specific rotation	2 marks	
		Construction	2 marks	
		Working of half shade polarimeter	2 marks	
Q.6	i.	Importance of metastable state	2 marks	**3**
		Diagram	1 mark	
	ii.	Construction + diagram	2 marks	**7**
		Working	2 marks	
		Energy level diagram	1 mark	
		Two characteristics	2 marks	
OR	iii.	A_{21}	1 mark	**7**
		B_{21}	1 mark	
		B_{12}	1 mark	
		A_{21}/ B_{21} relation	2 marks	
		Uses	2 marks	

******