

B. Sc. DEGREE END SEMESTER EXAMINATION MARCH 2018**SEMESTER – 4: PHYSICS (COMPLEMENTARY FOR MATHEMATICS)****COURSE: 15U4CPPHY7- PHYSICAL OPTICS, LASER PHYSICS AND ASTROPHYSICS***(Common for Improvement 2018/ Supplementary 2018/2017/2016/2015 Admissions)*

Time: Three Hours

Max. Marks: 60

PART A***Answer all. Each question carries 1 mark***

1. What is superposition principle of waves?
2. Copy the diagram below and label the nodes and antinodes on the standing wave shown below. Also identify one wavelength.



3. Give any two differences between prism spectra and grating spectra
4. Why dark and bright rings are formed in Newton's rings experiment?
5. What is meant by apparent brightness of a star?
6. What are biaxial crystals?
7. What is double refraction?
8. What is stimulated emission?

(1 x 8 = 8)

PART B***Answer any six questions. Each question carries 2 marks***

9. What is Brewster's angle? What is its significance?
10. In Young's double slit experiment, how is the fringe width altered if the separation between the slits is doubled and the distance between the slits and the screen is halved?
11. Explain half wave plate and quarter wave plate.
12. We cannot observe the diffraction pattern in a wide slit illuminated by monochromatic light. Why?
13. Explain what is Population inversion in lasing action?
14. What is an optical resonator? Why it is called so?
15. Explain the formation of a neutron star.
16. Explain the significance of Chandrashekhar Limit.

(2 x 6 = 12)

PART C***Answer any four questions. Each question carries 4 marks***

17. Draw pictures of two travelling waves that add up to form constructive interference and to form destructive interference.
18. A diffraction grating with 12,000 lines per *cm* separates bright line at 24.5 degrees. What is the wavelength of the light?.

19. Based on the geometry of Young's double slit experiment, show that the condition for constructive interference becomes $d \sin \theta = m\lambda$, $m = 0, \pm 1, \pm 2, \pm 3, \dots$
20. Light of wavelength 400 nm is incident on a single slit of width 15 microns . If a screen is placed 2.5 m from the slit. How far is the first minimum from the central maximum?
21. A ray of light is incident on the surface of a glass plate of refractive index 1.62 at the polarizing angle. Calculate the angle of refraction.
22. What is H R diagram? Sketch the diagram and locate the main sequence stars.

(4 x 4 = 16)

PART D

Answer any two questions. Each question carries 12 marks

23. Explain with neat diagram, how interference pattern is formed in thin films. Derive the conditions for brightness and darkness in a refracted system.
24. Explain the phenomenon of diffraction of light. Describe the theory of diffraction at a straight edge and analyze the pattern.
25. Describe the phenomenon of double diffraction in uniaxial crystals. Explain the phenomenon using Huygens's theory.
26. Explain three-level pumping scheme in lasing action. Describe the principle and working of Ruby Laser.

(12 x 2 = 24)
