B. Sc. DEGREE (C.B.C.S.S) EXAMINATION, APRIL 2018
(2014 Admission Supplementary)
SEMESTER IV – COMPLEMENTARY COURSE (PHYSICS)
PHY4PLA - PHYSICAL OPTICS, LASER PHYSICS AND ASTROPHYSICS
(For Mathematics)

Time: Three Hours   **Maximum Marks: 60**

PART A

I   Answer all questions. Each question carries 1 mark.

1.   State the conditions for obtaining interference pattern.
2.   Why Newton's rings are circular?
3.   What is diffraction?
4.   What is meant by a plane polarized light?
5.   What is birefringence?
6.   What is holography?
7.   Why does a three level laser produce pulsed output?
8.   What are the elements present on stellar atmosphere?

                                                                                      (1x8=8)

PART B

II   Answer any six questions. Each question carries 2 marks.

9.   Explain the principle of superposition of waves.
10.   Thick films illuminated by white light do not exhibit any colour in reflected light. Why?
11.   Distinguish between Fresnel and Fraunhofer diffraction.
12.   Briefly discuss quarter wave plates.
13.   Show that polarizing angle depends on the refractive index of the reflecting surface.
14.   What is population inversion? How can it be achieved?
15.   Discuss the properties of laser beam.
16.   Write a note on Nd – YAG laser.
17.   How can we measure the distances of stars using parallax method?
18.   Discuss about the generation of energy in stars.

                                                                                      (6x2=12)

PART C

III   Answer any four questions. Each question carries 4 marks.

19. Newton's rings are observed in reflected light of wavelength 5.9×10^{-5} cm. The diameter of the 10thdark ring is 0.5 cm. Find the radius of curvature of lens and the thickness of the air film.

20. A parallel beam of light of wavelength 5890 Å is incident at an angle of 30° on a plane transmission grating which has 7500 lines/cm. Find the highest order spectrum that can be observed.
21. A plane polarized light is incident perpendicularly on a quartz plate cut with its faces parallel to the optic axis. Calculate the least thickness of the quartz plate which introduces a phase difference of 60° between e- and o- rays.
22. Unpolarized light falls on two polarizing sheets placed one on top of the other. What must be the angle between the characteristic directions of the sheets if the intensity of the transmitted light is one third intensity of the incident beam?
23. Show that the probabilities of stimulated and spontaneous emission are the same.
24. Explain the terms (i) white dwarf (ii) Neutron star and (iii) black hole.

(4x4=16)

PART D

IV **Answer any two questions. Each question carries 12 marks.**

25. Discuss the formation of interference fringes on a screen due to monochromatic light passing through two parallel slits. Also arrive at the expression for fringe width.
26. Give the theory of diffraction at a straight edge and discuss its intensity distribution.
27. Discuss the construction, working and use of Nicol prism.
28. Describe the construction, working and theory of a ruby laser.

(2x12=24)