Reg. No…….. Name…… **20U438**

# B. Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2020

SEMESTER **– 4: PHYSICS (COMPLEMENTARY COURSE FOR MATHEMATICS)**

COURSE: **15U4CPPHY7, PHYSICAL OPTICS, LASER PHYSICS AND ASTROPHYSICS**

*(For Regular - 2018 Admission and Supplementary / Improvement 2017, 2016, 2015, 2014 Admissions)*

Time: Three Hours Max. Marks: 60

## PART A

(Very Short Answer Questions.) *Answer **all**. Each question carries **1** mark*

1. Define monochromatic waves.
2. How can coherent sources be obtained in practice?
3. Soap bubble or thin film of oil spread over the surface of water appears coloured in sunlight. Why?
4. Define the grating constant for a plane transmission grating.
5. What are the applications of Brewster's law?
6. What are variable stars?
7. Which are the basic components of a LASER
8. What are main sequence stars? (1 × 8 = 8)

## PART B

(Brief Answer Questions). *Answer **any six** questions. Each question carries **2** marks*

9. Is it necessary that the interfering waves should have same frequency? Justify your answer.
10. Why the central spot of Newton's rings is dark?
11. Describe the procedure to detect an elliptically polarised light.
12. What is the dispersive power of a grating? What are the parameters that determine the dispersive power?
13. Explain the construction of Nicol Prism.
14. What are the characteristics of stimulated emission of light?
15. What is Supernova? Explain.
16. What is Chandrasekhar limit? Explain its significance? (2 × 6 = 12)

## PART C

(Problems/Derivations.) *Answer **any four** questions. Each question carries **4** marks*

17. Newton's rings are observed using light of wavelength $\lambda=6250\times10^{-10}$ m. what thickness of air film underlies corresponding to each of the first three light rings?

18. When a light of 600 nm is incident normally on a transmission grating, the corresponding spectral line in the second order produces 33 degrees with central image. What is the total number of lines in the grating? The width of the grating is 4 cm.
19. A ray of light is incident on the surface of a plate of glass of refractive index 1.62 at the polarizing angle. Calculate the angle of refraction.
20. Describe the formation of a black hole.
21. Calculate the least thickness of a calcite plate which would convert plane polarized light into circularly polarized light. Given $\mu_o$ =1.486, $\mu_e$ =1.658 and wavelength of light is 5890 $A^O$
22. Calculate the ratio of stimulated emission to spontaneous emission if wavelength of radiation is 632.8 *nm* at a temperature of $9.8\times10^5$ *K*. Given *h*= $6.63\times10^{-34}$ (Planck's constant) and *k*=$1.38\times10^{-23}$ (Boltzmann constant) in SI units. (4 × 4 = 16)

**PART D**

(Long Answer Questions.) *Answer **any two** questions. Each question carries **12** marks*

23. Discuss the conditions for interference. Discuss Young's experiment and derive an expression for fringe width.
24. Derive Einstein coefficients and condition for light amplification. What is Neodymium YAG laser?
25. Describe how quarter wave and half wave plates are made? Explain their uses in the study of different types of polarized light.
26. Discuss the interference in thin films (Reflected system). Also explain the formation of colours in thin films.

(12 × 2 = 24)

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