Reg. No……. Name…… **18U438**

B. Sc. DEGREE END SEMESTER EXAMINATION MARCH 2018

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

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

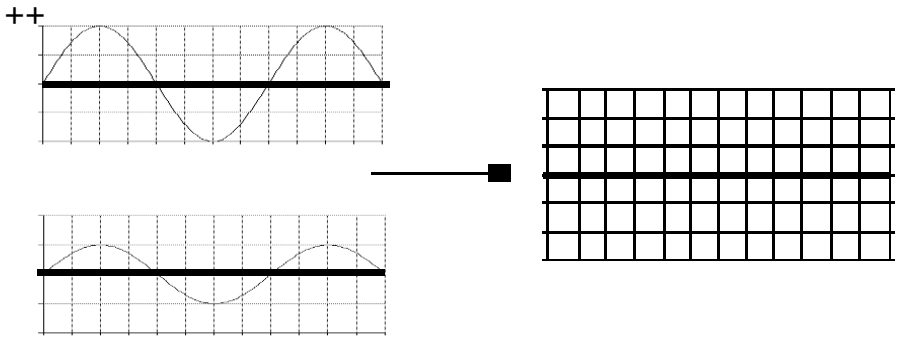
Common for Regular (2016 Admission) & Supplementary (2015 & 2014 Admissions)

Time: Three Hours Max. Marks: 60

PART A

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

1. What is the wavelength of a transverse wave if the distance between nodes is 2 m?
2. In this example, combine the waves to show CONSTRUCTIVE INTERFERANCE



3. In observing two interfering waves, the amplitude of the resulting wave can be found at every point using the principle of_____
4. Why dark rings are formed in Newton's rings experiment?
5. What is Huygens's principle in optics?
6. Give two examples of Polarizer.
7. What is unpolarised light?
8. How does laser light differ from "normal" light? (1 x 8 = 8)

PART B

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

9. Can two independent sources of light produce interference? Justify your answer.
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. Define and differentiate Fresnel and Fraunhofer diffraction.
12. We cannot observe the diffraction pattern in a wide slit illuminated by monochromatic light. Why?
13. Why a two level pumping scheme is not suitable for lasing action?

14. What are black holes?
15. Explain the formation of a neutron star.
16. What happens to the single slit experiment when the width of the slit is less than wavelength of the wave? (2 x 6 = 12)

PART C

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

17. Draw pictures of two traveling waves that add up to form constructive interference and to form destructive interference.
18. Based on the geometry of Young's double slit experiment, show that the condition for constructive interference becomes d sin Θ= mλ, m = 0, ±1, ± 2, ± 3, ...
19. If the number of lines per mm of a grating is 600, how many orders of spectra are possible for light of wavelength 589nm?
20. Two loud speakers are placed a few meters apart on a large field. They are connected to a signal generator and a single continuous note is produced through each of the speakers. A student walks back and forth in front of the speakers and notices that the volume of the sound rises and falls depending on his position. (a) Explain this observation. (b) When the experiment was repeated in a classroom the fluctuation in volume was noticeably less. Explain why this happens?
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 reflected system.
24. Describe the theory of a plane transmission grating and explain how it is used to find the wavelength of light using grating at normal incidence.
25. What is double refraction? Describe the construction, working and applications of Nicol prism.
26. Distinguish between Spontaneous emission and Stimulated emission in detail. Derive Einstein's coefficients for stimulated emission. (12 x 2 = 24)

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