

(4)

14. Two tuned circuits each containing an inductor, a capacitor and a small resistance are coupled inductively. An ac emf $v = V_0 \cos \omega t$ is now set up in one of them by an oscillator of variable frequency. Discuss how the current in the second circuit varies with the frequency ω . 5

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Ex/B.SC/PHY/22/HO7/64/2019(OLD)

BACHELOR OF SCIENCE EXAMINATION, 2019

(2nd Year, 2nd Semester, Old Syllabus)

PHYSICS (HONOURS)

Paper : HO-7

Time : Two hours

Full Marks : 50
(25 for each group)

GROUP - A

Answer any *five* questions.

1. What do you mean by the “missing order” of a grating ? If the width of the clear space is three times wider than the width of the opaque space in a grating then which orders will be missing in the diffraction fringe pattern ? Explain your answer. 5
2. “The intensity of light waves coming out of a plane wave front is proportional to the square of the half displacement of the first half period zone” – Justify the statement. Draw the schematic diagram and discuss in brief the action of Michelson’s interferometer. 5
3. Deduce the expression of Lorentz formula for normal dispersion. 5
4. What is the plane of polarization ? How do you determine the plane of polarization ? State the Brewster’s law of polarization. 5

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(2)

5. Sodium light of wave length 5890 \AA and 5896 \AA is made incident normally on a grating having 10^4 lines per inch. Calculate the angular dispersion of these lines in the spectrum of first order. State the condition under which one can view the missing order of a grating. 3+2
6. The objective of a Telescope has the diameter of 100 inches. Assuming the mean wavelength of the incident beam to be 5500 \AA , calculate the least angular separation of two stars that can be resolved by it. Determine the linear separation between the images of the two stars at the focal plane of the objective. (Given the focal length of the objective is 5 meters). 5
7. How Febry-Perot interferometer is used to determine an unknown wavelength? Compare the fringe-pattern produce by Febry-Perot and Michelson interferometers. 3+2

GROUP - B

Answer any *five* questions.

8. State Norton's theorem. Is it applicable to both dc and ac? Is it an independent law or can be derived from Kirchhoff's laws? What do you by an ideal voltage source? 5

(3)

9. Discuss the sensitivity of a Wheatstone bridge in terms of current through the unknown resistance, positions of galvanometer and battery and the internal resistance of the galvanometer. 5
10. A 100 V, 60W lamp is to be operated on 220 V, 50 Hz supply. What (a) pure resistance (b) pure inductance placed in series with the lamp will enable it to be correctly used? Which method will be more economical and why? 5
11. Show that maximum power will be transferred from a source to a load when the load impedance is a complex conjugate of the internal impedance of the source. Cite one practical example where this idea is used. 5
12. What do you mean by current and voltage resonances in series LCR circuit? Find an expression for the half power band width of a series LCR circuit in terms of circuit parameters. 5
13. An ac emf $v = V_0 \cos \omega t$ is now applied across an inductor L, capacitor C and a resistor R all connected in parallel. Find the resonant frequency and Q-value of the circuit. 5

(Turn Over)