`TRIBHUVAN UNIVERSITY

2081(Regular)

Bachelor Level **(4 Yrs.)**/ Science & Tech. / II Year

Optics, Modern Physics and Electronics — Full Marks: 100

(PHY.201) — Time: 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt All Questions

1. Explain construction, working and applications of Michelson interferometer. How would you use it to measure the wavelength of monochromatic light. 10]

OR

Describe how, with the help of a Nicol prism and quarter wave plate, plane polarised light, circularly polarised light and elliptically polarised light are produced and detected.

2. What do you mean by Zeeman effect and Stark effect? Discuss anomaloces Zeeman effect. [10]

OR

Explain Stern-Gerlach experimental set up and its working. Discuss the results of this experiment concerning vector atom model. How did Sommerfeld modify Bohr's model?

3. Draw the circuit diagram of a basic FET amplifier and explain its operation. [10]

OR

Discuss Thevenin's and Norton's Theorem with their applications. Write down the Steps to a typical electric circuit through Norton's Theorem.

4. How diffraction pattern can be obtained through a single and a double slit? Discuss difference between single and double slit diffractions. [8]

5. Explain the laws of successive radioactive disintegration. Use this law to explain any one natural radioactive series. [8]

6. Draw a circuit following a stable multivibrator and explain its operation. What is the frequency of the circuit? [8]

7. Answer any TWO of the following. [2×3=6]

a) Explain in brief the dispersive and resolving power of grating.
b) Explain in brief about astigmatism
c) What is common mode rejection ratio (CMRR) in operational amplifier?
d) Distinguish Rutherford and Compton scattering.

8. Answer all questions [4×2.5=10]

a) What are the applications of holography?
b) Briefly describe the objectives of Large Hadron Collider (LHC).
c) What is gravitational red shift?
d) Describe X-OR gate with truth table.

9. A Ramsden's eyepiece is to have on effective focal length of 3 cm. Calculate the focal length of lens component and their distance of separation. [5]

10. How many orders will be observed by a grating having 4000 lines/cm if it is illuminated by a visible light of wave length in the range of 4000 α Å to 7500 Å? [5]

11. Calculate the time required for 10% of a sample of thorium to disintegrate. Assume the half life of thorium to be 1.4×10^{10} years. [5]

12. X-rays of wavelength 1.0×10^{-11} m are incident on free stationary electrons. What is the wavelength of the X-ray that are scattered directly backwards? What is the energy gained by the scattered electron's in this case.

Given : $m_e = 9.11 \times 10^{-31}$ kg
$c = 3 \times 10^8$ m/s
$h = 6.62 \times 10^{-34}$ JS

13. A dc and an ac voltmeter were used to measure the output voltage from a filter circuit. If the readings of the two voltmeters are 25 volt and 2.5 volt respectively, calculate the ripple factor of the filter circuit. [5]

14. Convert 110011 and 101101 into their decimal number and add them. [5]