

SECOND YEAR B.Sc. DEGREE EXAMINATION, APRIL/MAY 2005**Part III—Physics Subsidiary****Paper II—OPTICS, ELECTRICITY AND MAGNETISM ELECTRONICS, MODERN PHYSICS AND CRYSTALLOGRAPHY (For Geology Main)**

Time : Three Hours

Maximum : 50 Marks

Section A*Answer any two of the following questions.**Each question carries 7 marks.*

1. Define cardinal points of a lens system. Show that their number reduces to four only if the media on either side of the system are the same.
2. (a) Distinguish clearly between Fresnel's and Fraunhofer classes of diffraction giving suitable example.
(b) Give the theory of plane transmission grating and show how would you use it to determine the wave length of light.
3. What do we mean by biasing of a transistor ? On which factors does the selection of an operating point depend ? Why does the operating point of a transistor shift ? What is thermal runaway ?
4. (a) Give an account of various quantum numbers associated with the vector atom model.
(b) Explain the periodic classification of elements with the help of the Pauli's exclusion principle.

 $(2 \times 7 = 14 \text{ marks})$ **Section B***Answer any twelve of the following questions.**Each question carries 2 marks.*

5. What is an eye piece and what are its advantages over a single lens ?
6. Distinguish between temporal and spatial coherence.
7. State the condition for obtaining circular fringes in Michaelson's interferometer.
8. Describe the intensity distribution in the diffraction pattern due to a straight edge.
9. What is a quarter wave plate ? Compare it with half wave plate.
10. What do you understand by unpolarised, elliptically polarized and circularly polarized light ?
11. List the important features of stimulated emission. Discuss the essential requirements of producing a laser beam.
12. Distinguish between diamagnetic, paramagnetic and ferromagnetic substances. Give suitable examples also.
13. Describe how a magnetometer can be used to measure unknown magnetic fields.
14. What is meant by time constant in an RL circuit ?

15. Sketch the circuit of a full wave rectifier and discuss the effect of the filter stage on the output voltage.
16. Draw the logic symbol and truth table of an OR gate. How it differs from XOR gate ?
17. What is meant by continuous and characteristic X-ray spectra ?
18. What are nuclear forces ? What are their important features ?
19. Give an account of the mode of operation of a scintillation counter.
20. Give the working principle of an atomic absorption spectro photometer.
21. What is remote sensing ? Mention the application of electromagnetic waves in remote sensing.
22. List the important symmetry operations associated with space lattice structure.
23. What is coordination number ? Calculate the coordination number for simple cubic, bcc and fcc lattices.
24. What do you understand by Miller indices of a crystal plane ? How do you find them ?

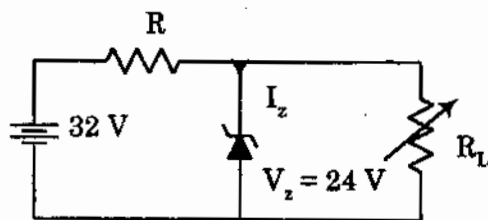
(12 × 2 = 24 marks)

Section C

Answer any four of the following questions.

Each question carries 3 marks.

25. In a Newton's rings experiment, the diameter of the 4th and 12th dark rings are 0.40 cm and 0.70 cm respectively. Deduce the diameter of 20th dark ring.
26. 20 gms. of cane sugar is dissolved in water to make 50 cm³ solution. A 20 cm. length of this solution causes +53.5° optical rotation. Calculate the specific rotation.
27. A resistance of 3 ohms and a capacitor of capacity 800 μF are connected in series across 220 Volt 50Hz AC. Calculate.
 - (a) Capacitive reactance.
 - (b) Total impedance and
 - (c) Current in the circuit.
28. A 24 V, 600 mW zener diode is to be used for providing a 24 V stabilized supply to a variable load as shown in the figure. If input voltage is 32 V calculate the
 - (a) Series resistance R required.
 - (b) diode current when $R_L = 1200$ ohms.



29. A phase shift oscillator using PNP transistor has the following circuit constants. $V_{cc} = -10V$, $R_1 = R_2 = R_3 = 3.2 \text{ k}\Omega$, $R_L = 10 \text{ k}\Omega$, $C_1 = C_2 = C_3 = 0.02 \text{ }\mu\text{F}$. Calculate the frequency of oscillation.
30. X rays of wave length 0.12 nm are found to undergo second order reflection at a Bragg angle of 28° from Lithium Fluoride crystal. What is the inter planar spacing of the reflecting planes in the crystal?
31. A radio active isotope of Mercury ^{197}Hg decays into Gold ^{197}Au with a disintegration constant of 0.0108h^{-1} . a) Calculate its half life. What fraction of a sample will remain at the end of three half-lives?

(4 × 3 = 12 marks)