



KUVEMPU UNIVERSITY
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TOPICS FOR INTERNAL ASSESSMENT ASSIGNMENTS (2008-09)
Programme: M.Sc. PHYSICS (Previous)

Note: Students are advised to read the separate enclosed instructions before beginning the writing of assignments.

Out of 15 Internal Assignment marks per paper, 5 marks will be awarded for regularity (attendance) to Counseling/ Contact Programme/ Practical classes pertaining to the paper. Therefore, the topics given below are only for 10 marks each paper.

Paper I: MATHEMATICAL METHODS AND CLASSICAL MECHANICS

- 1 Find the eigenvalues and normalized eigenvectors of the matrix **5 marks**

$$A = \begin{pmatrix} a & b & b \\ b & a & b \\ b & b & a \end{pmatrix}; a, b \text{ are real numbers, such that } a \neq b$$

- 2 a) Find the residues of the function **3 marks**

$$f(z) = \frac{e^z}{(z^2 + 4)^2}$$

- b) Distinguish between a Pole and an essential singularity **2 marks**

Paper II: QUANTUM AND STATISTICAL MECHANICS

- 1 a) Find the probability of a two electron system to be in triplet state when the total angular momentum of the system is 1. What is the probability of the same two electron system to be in singlet state when the total angular momentum of the system is **3 Marks**
(i) 1 (ii) 0

- b) Find the expectation value of the position operator when the state of the system is a Gaussian given by $\psi(x) = e^{-(\alpha^2 x^2)}$ **2 Marks**

- 2 N particles are distributed among three states having energies $E=KT$, $E=2KT$, $E=3KT$ in canonical distribution. If the total equilibrium energy of the system is $2000KT$, find the value of N **5 marks**

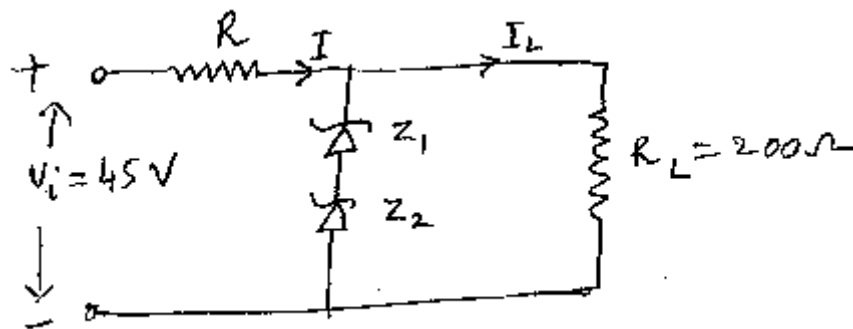
Paper III: SOLID STATE PHYSICS

- 1 The Fermi energy of Silver is 6.51 eV. 5 marks
 - a) What is the average energy of Silver at 0K
 - b) Find the temperature that is necessary for the average molecular energy of an Ideal Gas to have this value?

- 2 Construct the reciprocal lattice for a two – dimensional lattice in which 5 marks
 $a=2.4\text{\AA}^0$, $b=1.43\text{\AA}^0$ and $\gamma = 120^0$

Paper IV: ELECTRONICS

- 1 The circuit of figure uses two Zener diodes each rated at 15v, 200mA. If the circuit is connected to a 45volt unregulated supply, determine 5 marks
(i) the regulated o/p v_g (ii) the value of series resistance R.



- 2 a) Calculate the frequency of oscillations of calpitt’s oscillator having 5 marks
 $C_1=C_2=100$ Pico farad & L 1mH in the tank circuit
- b) A Hartley Oscillator has tank circuit inductance $L_1=L_2=100\mu\text{H}$. It is required to design the oscillator to produce oscillations at 50KHz. Obtain the exact value of the tank circuit capacitance for the above requirement. Draw the tank circuit with L & C values.
