The thesis deals with studies on several properties of anisotropic superconductors containing paramagnetic impurities in Shiba-Husinov model. I have investigated the effect of gap anisotropy on the Josephson current for an impure superconductor described by SR model. It is observed that as the impurity concentration is increased, the Josephson current gradually decreased and finally goes to zero for a particular value of the impurity concentration. For a given impurity concentration if we increase the Josephson current also increased. The values of the normalized Josephson current for various values of impurity concentration and for two values of the local states within the gap & are given in Table 1. Figure 1 shows the nature of variation of the normalized Josephson current with $T/T_c$ for $C = 0.95$. We noticed that when $C = 0.9$, the effect of anisotropy is to decrease Josephson current. As we increase the impurity concentration the Josephson current will be increased due to anisotropy.

When $T/T_c > 1$ as we increase ($T/T_c$) we found that the percentage change in the slope of Josephson current versus ($T/T_c$), $K^*$ gradually decreases where as when ($T/T_c$) is less than one, the above quantity increases as we increase ($T/T_c$).

The slope of Josephson current versus ($T/T_c$), $K^*$ is tabulated for various values of $T/T_c$. For ($T/T_c$) 1, as more and more impurities are added, the effect of anisotropy is to increase the percentage change in $K^*$ due to anisotropy. For ($T/T_c$) 1, increase of impurity will decrease the percentage change in $K^*$ due to anisotropy.

When $<\alpha^2> < 0.01$, $K^* = 0.01$ giving a 94.03% deviation from previous calculations. $K^*_{\text{max}} = 0.129$ (for $C = 1$ and $<\alpha^2> = 0$). As the strength of interaction increases ($<\alpha^2>$ the effect of anisotropy on $\Delta(C,T)$, $H_x(C,T)$, and $J_y(C,T)$ is small, but if the strength of interaction decreases ($<\alpha^2>$) the effect of anisotropy is more prominent. For a given value of $C$, for small impurity concentration, the effect of anisotropy is to increase $\Delta(C,T)$, $H_x(C,T)$, and $J_y(C,T)$ but for large impurity concentrations the effect of anisotropy is to reduce the above quantities.

I have calculated the anisotropic density of electronic states, $N_{\text{anisotropic}}(\omega) = \frac{N_{\text{ideal}}(\omega)}{N_{\text{ideal}}(0)}$. Outside BCS energy gap ($\omega > 1$) density of states will be decreased due to anisotropy and inside BCS energy gap ($\omega < 1$) it is increased for anisotropic superconductors.

For given impurity concentration as we increase the strength of interaction (decrease $\alpha$) we observe that the percentage change in the normalized slope of ultrasonic attenuation coefficient ($C^*C^*_{\text{anisotropic}}$) will be more. The normalized upper critical field $h^*_u(T)$ increases due to anisotropy as we increase the impurity concentration. For a given impurity concentration as we increase the strength of interaction, anisotropy will increase the percentage change in $h^*_u(T)$.

The normalized slope of upper critical field versus $T/T_c$, $h^*_u(T)$ also behaves the same way as $h^*_u(T)$ with anisotropy.

I have observed that the local states within the BCS energy gap is anisotropic.

The response to a weak transverse electric isotropic superconductor. The response function $\Delta(0,\omega)$ in the limit of $\alpha \rightarrow 0$, the equation (3.2)

The Kondo effect of some of our problems.
The response to a weak transverse electromagnetic field is studied for an isotropic superconductor. The response function agrees with equation (16) of K. Maki (54). In the limit of \( q_s \to 0 \), the equation (3.117) reduced to that of Chabu (55).

The Kondo effect of some of our problems is also investigated.

S.P.16. SEBASTIAN, P.J.-Fabrication and parametric measurements of N2 laser pumped dye laser and its application to energy transfer studies in mixed dyes--1982--Dr. K. Sathianandan

This thesis reports a detailed study of the performance characterisation of a N2 laser-pumped dye laser in the conventional mode and also when pumped by the energy transfer mechanism. It was shown that performance characteristics of the dye laser can be controlled by system parameters. Suitable modifications were suggested for obtaining better conversion efficiency and bandwidth.

S.p.17. PAUL, C.M.-Studies on molecular structure and properties using microwave and infrared spectral data--1983--Dr. C.P. Girijavallabhan.

This thesis reports certain computational procedures to extract maximum amount of information regarding the geometrical structure and inter-atomic forces of simple molecules from experimental data on microwave and infrared spectra. A novel feature of these studies is the use of centrifugal distortion constants for the determination of the geometry of symmetric top molecules. The method developed here shows that reliable information of the molecular geometry can be carried out even when the microwave spectroscopic data on isotopic molecules are not available.

S.p.18. MOHANACHANDRAN, K.-Formation and electrical properties of polyacrylonitrile thin films prepared by plasma-polymerisation--1983--Dr. K. Sathianandan

Plasma-polymerised PAN thin films sandwiched by aluminium electrodes were prepared. The mechanisms of plasma-polymerisation was studied by analysing the emission spectra formed from acrylonitrile vapour. Thermally stimulated current in PAN was studied to obtain information regarding the dipolar orientation and charge storage mechanism in the polymer. Dielectric and electrical properties of PAN film were also studied.

S.p.19. KURIAKOSE, V.C. Studies in quantum field theory at finite temperature--1983--Dr. K. Babu Joseph

The thesis deals with certain quantum field systems exhibiting spontaneous symmetry breaking (SSB) and their response to temperature. These models are of interest in particle physics, solid state physics and nonlinear optics. The nature of phase transition that these systems may undergo is also investigated. The main theoretical tools employed to understand these properties are the