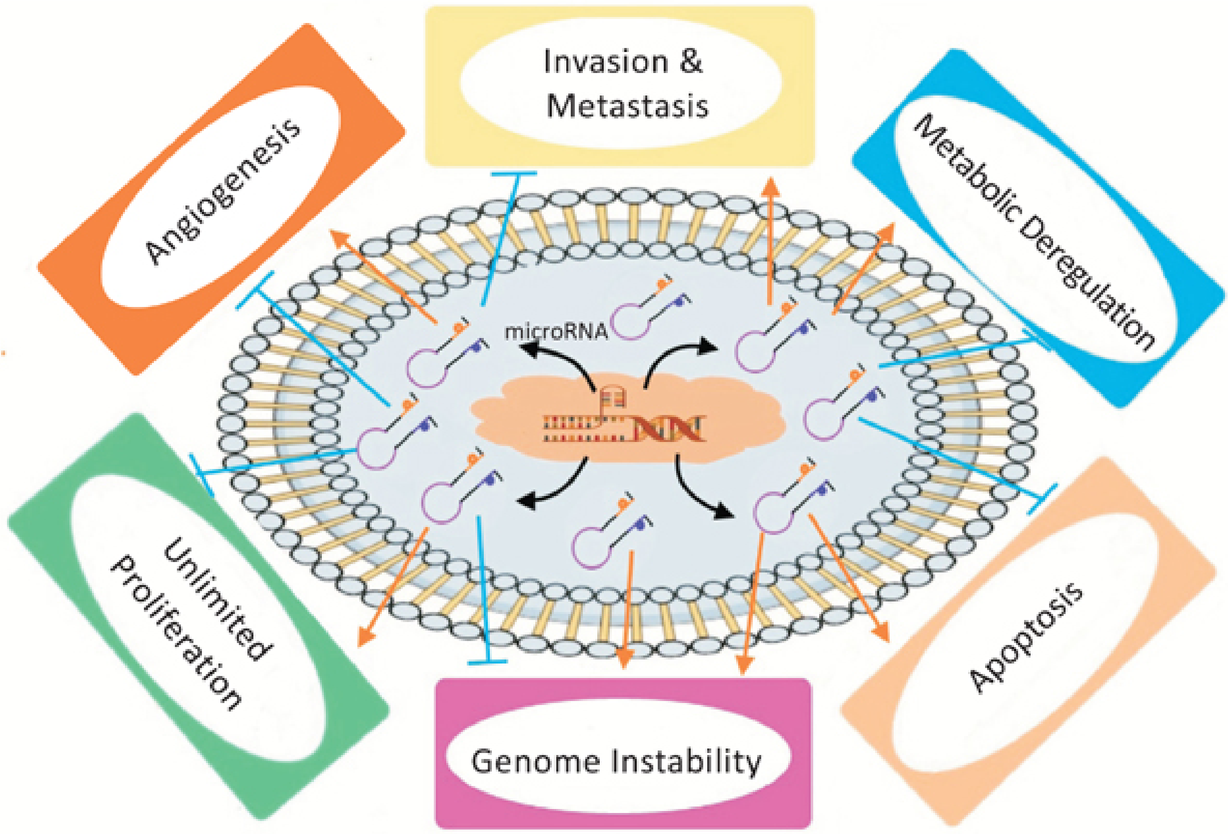
Microwave Devices And Circuits Samuel Liao Solution Manual.pdf



1), (.2), and (.3), find the eigenvalues and eigenvectors of the operators . The solutions are and . 3. Assuming that the state of motion of an electron is confined to the x-y plane, find the wave function in terms of its modulus and argument. For the allowed wave function you will find and . ## Physical Forces and Forces It may seem paradoxical that different physical forces have the same mathematical expression, namely (1.1) where the is the set of all particles. But we will see that this mathematical coincidence has a very important physical meaning. It represents the fact that the different forces are all mathematically proportional to a single quantity, which we can call the -matrix, given by (1.2) The scalar value of the matrix depends on the type of forces that are acting on the system. For example, the product represents the gravitational force, the product represents the electrical force, and so on. In fact, this matrix describes all forces that act on the system in a given coordinate system, since for each particle is a vector in the -space, and it can be decomposed into components that are parallel or perpendicular to the coordinate axes. The dimensions of the matrix is , but its trace is . Figure 1-3-2 The matrix can be used to classify forces. If the forces are of the same type, i.e., all parallel or perpendicular to the axes, then the matrix has eigenvalues that are all equal, or in other words, all have the same absolute value, and their signs indicate which type of forces are acting. If one of the eigenvalues has a negative value, then the forces in that direction are attractive, and if the eigenvalue is positive, then the forces are repulsive. This leads to the definition of forces as vectors that have a positive or negative eigenvalue, and these vectors can be multiplied by the matrix to form new vectors that represent the forces. For example, to determine the force in the y-direction, the vector is multiplied by the matrix and the result is a vector, which, in this case, is parallel to the -axis. Thus, the forces in the y-direction are called the attractive forces 82157476af