REVIEW-QUESTIONS (Ch.10)

10.1. What specific feature distinguishes a boundary value problem from an initial value problem for an ordinary differential equation?

10.3. A boundary value problem for an ODE always have a unique solution.

10.4. The stability of a boundary value problem is always the same as that of the associated initial value problem for the same ODE.

REVIEW-QUESTIONS (Ch.10) (cont.)

10.6.For solving a two-point BVP for a *nonlinear* ODE, both the **finite difference** method and the **shooting method** are iterative. One of these approximately satisfies the ODE at each iteration, but satisfies the BC only upon convergence, whereas the other satisfies BC at each iteration, but approximately satisfies the ODE only upon convergence. Which is which?

REVIEW-QUESTIONS (Ch.10) (cont.)

10.8. When a finite difference method is used to convert a BVP $u'=f(t,u,u)$ into a system of algebraic equations, what property determines whether the algebraic system will be linear or nonlinear?

10.9. Finite difference and finite element methods for solving BVP convert the original differential equation into a system of algebraic equations. Why does the resulting linear system usually require far less work to solve than the usual $\mathbf{O}(n^3)$ that might be expected?

REVIEW-QUESTIONS (Ch.10) (cont.)

10.12. In solving a BVP, what requirement does the collocation method impose on the approximate solution?

10.13. Suppose you are solving a two-point BVP for a linear 2nd-order ODE using the standard 2nd-order centred finite difference approximations to the derivatives. Describe the nonzero pattern of the matrix of the resulting system of linear algebraic equations.

REVIEW-QUESTIONS (Ch.10) (cont.)

10.14. Suppose you are using the shooting method to solve a two-point BVP for an ODE on an interval [*a, b*]. If the ODE in question is unstable on some portion of the interval, then the resulting sequence of IVPs may be very sensitive to initial conditions, making it difficult to hit the required boundary condition.

(a) How could you cope with such ill-conditioning?

(b) How would this affect the nonlinear algebraic equation to be solved.

REVIEW-QUESTIONS (Ch.10) (cont.)

10.15. In solving a two-point BVP numerically, the approximate solution produced by collocation at a finite set of points always agree with the exact solution at those points?

10.16 For each type of method listed for solving two-point boundary problems for ODEs, state whether methods of this type convert the ,BVP to one or more IVPs or to a system of algebraic equations:

(a)Finite difference

(b)Shooting

(c)Finite element

PARALLEL BOUNDARY VALUE PROBLEM (Ch.10)

•For shooting method parallel solution of IVP will be required.

•However, if multiple shooting has to be used for better stability, there is an additional opportunity for parallelism, because more IVP problems can be solved in parallel.

•If either the finite difference method, or collocation method or Galerkin method is used, the parallel solution of an algebraic system are required. There are several efficient approaches to this problem.