ESL-300 ESL300 Maximum Marks 40

Dated 25th November 06

Time: 2hrs (11 AM to 1 PM)

Note: Attempt all questions

Q.N.1. Explain the concept of fractal and fractal diamension. Construct a fractal structure by taking squares of relative area $\frac{1}{9}$ out of the centre of large squares. Give atleast 3 steps of construction. Calculate the box-counting diamension of this fractal structure. Justify your answer. ---- (10)

Q.N.2. If the action integral I of a dynamical system is given by

$$I = \int L(R_x, R_y, R_z; R_{xx}, R_{xy}, R_{xz}; R_{yx}, R_{yy}, R_{yz}; R_{zx}, R_{zy}, R_{zz}, x, y, z)\, dx\, dy\, dz$$ ---- (12)

Calculate the dynamical equations satisfied by the system. The symbols have their usual meanings.

Q.N.3. Calculate the number of fixed points and their values if $b = 1.5, 3, 3.3$ and $1+\sqrt{6}$ for logistic map. Also calculate the number of attractors, their values and the period of the stable cycle. Justify your results. --- (8)

Q.N.4. Write short notes on

(a) propagator and winding number

(b) Bifurcation and chaos

(c) Siegel and Hénon map (10)

— o —