(I'll upload a typed version when I get back to my office)

① DESCRIBE THE FOLLOWING.   (10 pts)

(a) k_∞ (b) k_{eff} (c) ATOM DENSITY
(d) ENRICHMENT   (e) COMPOUND NUCLEUS
(f) ENERGY SELF SHEILDING   (g) MODERATOR
(h) DELAYED NEUTRONS   (i) REACTOR PERIOD
(j) REACTIVITY.

STEADY STATE
② DERIVE DIFFUSION EQUATION (ENERGY INTEGRATED)
FOR 2D CARTESIAN GEOMETRY.   (20 pts)

③ DERIVE KINETIC EQUATION (FINITE, MULTIPLYING
SYSTEM). IF TO USE IT FOR 4 DELAYED NEUTRON
PRECURSOR GROUPS.   (10 pts)

④ DERIVE IN-HOUR EQUATION & DESCRIBE THE PROCEDURE
TO SOLVE INHOUR EQUATION.   (10 pts)

⑤ 5.1 from text book   (5 pts)

⑥ 5.9 from text book   (10 pts)

⑦ 4.12 from text book   (5 pts)

⑧ 1.18 from text book   (5 pts)

(9) 2.14 from textbook (5 pts)

(10) A POWER REACTOR IS COOLED BY HEAVY WATER (D_2O) BUT A LEAK CAUSES 5% CONTAMINATION OF COOLANT WITH LIGHT WATER (H_2O). DETERMINE THE RESULTING PERCENT INCREASE / DECREASE IN

(10 pts)

(a) SLOWING DOWN DECREMENT
(b) SLOWING DOWN POWER
(c) SLOWING DOWN RATIO

(11) WRITE DOWN (10 pts)
(a) WEIGHTED RESIDUAL form
(b) WEAK Form
(c) STRONG form for

$$-D\nabla^2\phi + \Sigma_a\phi = \frac{\nu\Sigma_f}{k}\phi + S \quad \text{IN } 3D.$$

(12) EXTRA CREDIT : (20 pts)

SOLVE SLAB GEOMETRY DIFFUSION EQUATION

$$-\frac{\partial}{\partial x}D\frac{\partial\phi}{\partial x} + \Sigma_a\phi = S$$

(a) USING FINITE DIFFERENCE
(b) USE 2-GRID MULTIGRID TO SOLVE THE MATRIX SYSTEM

Dx $\Sigma_t = 1$; $S = 1$
$\Sigma_a = 0.5$.

USE REFLECTING BOUNDARIES ON BOTH SIDES.