

ENGINEERING PHYSICS 6D3

Modular course problem set #2

Dr. Wm. Garland

McMASTER UNIVERSITY

Due Sunday morning October 18, 2003

Special Instructions: The value of each question is 25 marks. TOTAL Value: 100 marks

1. Consider an infinite planar source of neutrons in an infinite absorbing medium. The source strength is S neutrons/cm²/sec. Given the resulting flux distribution as derived in class, determine the absorption rate at any point in space and show that the total absorption rate of neutrons equals the production rate of neutrons.
2. A bare spherical reactor is just critical. What happens if it is surrounded by layer of cadmium? Justify your answer.
3. A bare, homogeneous cubic reactor can be characterized by one group neutron diffusion, $D = 10$ cm., $\Sigma_a = 0.1$ cm.⁻¹, height = width = length = 100 cm. What is the neutron leakage probability?
4. For an infinite cylindrical reactor (radius a) with a reflector boundary (outside radius b):
 - a) State the 1 group steady state neutron diffusion equations for the core and reflector regions.
 - b) State and justify your boundary conditions.
 - c) Outline the procedure for solving the above equations. Don't solve the equations; it is quite time consuming. Indicate how you would find the criticality equation.
 - d) Sketch the flux distributions. Explain any significant features.
 - e) Write the delayed precursor equations for this case. How will the steady state flux be altered by the inclusion of the delayed precursor equations? Justify your answer.