LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **PHYSICS**

THIRD SEMESTER – **NOVEMBER 2022**

PPH 3602 – REACTOR PHYSICS

Date: 02-12-2022 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART- A

Q. No Answer all questions (10 x 2 = 20 Marks)

1 Why is C_{12} chosen to define atomic mass unit (amu)?

2 Define the binding energy of a nucleus.

3 What is the breeding process in nuclear reactor?

4 What do you mean by conversion in nuclear reactor?

5 Define thermal utilization.

6 What do you mean by neutron moderation?

7 When will a reactor be prompt critical and subcritical?

8 Point out the connection between reactivity and multiplication factor.

9 Enumerate the types of control rods.

10 Define shadowing effects in a ring of rods.

PART – B

Answer any four questions (4 x 7.5 = 30 Marks)

11 Derive an expression to find the critical value of a nuclear reaction.

12 Discuss fuel burnup, rector power and consumption rate of nuclear reactor.

13 Discuss the criticality of an infinite homogeneous reactor.

14 Explain the infinite reactors without delayed neutrons.

15 Discuss the reactor safeguards for effective operation of nuclear reactor.

16 Derive the equations to determine the concentration of fission isotopes using burnup and conversion.

PART – C

Answer any four questions **(4 x 12.5 = 50 Marks)**

17 Describe the mechanism of nuclear fission reaction and discuss the practical fission fuels.

18 a) Explain the moderation of neutron in hydrogen. **(7.5 Marks)**
b) Define lethargy and compute the average increase in lethargy per unit collision. **(5 marks)**

19 Obtain an expression for diffusion length and explain the reciprocity theorem.

20 Derive Fick's law for the diffusion of neutrons and interpret its physical importance.

21 Explain the control rods worth using one and two group theory.

22 Explain the theory of Interaction rate and Neutron flux.

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