QP CODE: 20100437

20100437

Reg No : .....

Name : .....

BSc DEGREE (CBCS) EXAMINATION, MARCH 2020

Sixth Semester

Core course - PH6CRT11 - NUCLEAR, PARTICLE AND ASTROPHYSICS

B.Sc Physics Model I,B.Sc Physics Model II Computer Applications,B.Sc Physics Model III Electronic Equipment Maintenance,B.Sc Physics Model II Applied Electronics

2017 Admission Onwards

3E35C0A6

Time: 3 Hours Marks: 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. What is the binding energy per nucleons for Fe nucleus ?
2. Give some examples of magic nuclei.
3. What are the different kinds of attractive forces that can be conceived in the nucleus ?
4. Give any two uses of betatron.
5. Define activity.
6. Write any two hazards of radiation.
7. What is tokamak?
8. Explain how the intensity of cosmic ray varies from sea level to higher altitude.
9. Distinguish between hard cosmic rays and soft cosmic rays.
10. Write down the equation for the neutral pion decay.
11. What is meant by charge conjugation symmetry.
12. According to quark model, what is the electric charge of a hadron?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Explain why the proton-electron hypothesis about nuclear composition was rejected?

14. What is the density of the nucleus to that of water?

15. Give a simple derivation for the semi empirical mass formula.

16. Explain the working of Bubble Chamber.

17. Write down the Uranium series from the parent element to the end product showing α and β emission.

18. Calculate the Q- value for the formation of P^{30} in the ground state in the reaction $Si^{29}(d,n)P^{30}$ from the following cycles of nuclear reactions

    $P^{31} + \gamma = P^{30} + n - 12.37MeV$

    $P^{31} + p = Si^{28} + He^4 + 1.909MeV$

    $Si^{28} + d = Si^{29} + p + 6.246MeV$

    $Si^{29} + d = P^{30} + n + Q$

    $2d = He^4 + 23.834MeV$

19. Calculate the energy released by fission of 1g of U^{235} in KWh. Energy per fission is 200MeV.

20. Estimate the distance to a 6000K main sequence star with an apparent brightness of 20 x 10^{-12} W/m^2

21. Write a note on stellar evolution.

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. Explain the difference between ionization chamber, proportional counter and GM counter.

23. Explain the working of Vande Graaff generators ? What are the limitations.

24. What is α decay? Explain tunnel theory of α -decay. How many alpha particles are emitted when $_{92}U^{238}$ decays to $_{82}Pb^{206}$?

25. Explain the elementary particle quantum numbers.

(2×10=20)