QP CODE: 25801368

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Reg No : .....

Name : .....

INTEGRATED MSC DEGREE EXAMINATION, MARCH 2025

Sixth Semester

INTEGRATED MSC BASIC SCIENCE-PHYSICS

CORE - IPH6CR04 - PARTICLE PHYSICS

2021 Admission Onwards

CBED3FD3

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Whys is the van de graff generator called an electrostatic accelerometer ?
2. What are the advantages of using a synchrotron to accelerate a particle ?
3. Is the given decay mode of free proton possible? Explain.
   $p \rightarrow e^{+} + \pi^{0}$
4. What is the azimuth effect of the cosmic rays?
5. Why was the discovery of the pion important for the Yukawa hypothesis?
6. What are the key decay modes of pi mesons, and how do they reflect their role in particle interactions?
7. List and describe the six types of quarks.
8. What are the key features of the particle era of the universe?
9. What are the properties of Higgs boson?
10. What is Rutherford backscattering spectroscopy?

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. A cyclotron of maximum radius 0.25m accelerate a proton in 2T magnetic field. Calculate the frequency needed for the applied alternating voltage. Also evaluate the kinetic energy of the proton when they leave the cyclotron.
12. Assume that in a 70MeV Betatron the radius of the stable electron orbit is 20cm. Calculate a) angular velocity of electron b) frequency of the applied electric field. C) the value of the magnetic field intensity.

13. What are the advantages of the optical model of nuclear reactions?

14. What is CP invariance ? Is it violated in any observable reactions ? Explain.

15. Identify the unknown particle in the reaction below using the conservation laws.
    a) $\mu^- + p \rightarrow {}^{1}_{o}\mathrm{n} + \cdots$
    b) $\pi^- + p \rightarrow K^0 + \cdots$

16. Write a short note on quantum chromodynamics and the introduction of colour quantum number.

17. Explain the state of universe 1 microsecond after the Big bang explosion.

18. Give any five sources of gravitational waves.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Explain how the diffussion of fast neutrons occur and hence arrive at the Fermi age equation.

20. Discuss the theories for the orgin of the Universe. Explain how the density of the Universe can be a determining factor for its future and arrive at an expression for this density.

21. Discuss and classify the different types of fundamental interaction in nature. What attempts have been made to unify them?

22. Explain in detail the various process involved in the stellar nucleosynthesis for the the elements heavier than iron (A>60).

(2×5=10 weightage)