C 61255 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2019

(CUCBCSS—UG)

Physics

PHY 4C 04—ELECTRICITY MAGNETISM AND NUCLEAR PHYSICS

Time : Three Hours Maximum : 64 Marks

I. Answer *all* questions, each question carries 1 mark :

1 A hollow sphere of copper is positively charged. Then the electric field inside the sphere is ———.

2 A charge Q is divided into two parts and the two parts are separated by a certain distance. The force between them will be maximum if one of the charges is ———.

3 If electric field is uniform, electrical lines of force are ———.

4 Three resistors 2Ω, 3Ω, and 5Ω are connected in parallel across a battery of 10 V and of negligible internal resistance. The potential difference across the 3Ω resistor is ———.

5 If a wire is stretched to make it 0.1 % longer, the percentage change in its resistance would be ———.

6 The unit of magnetic induction in SI system is ———.

7 The arms of a deflection magnetometer in broadside on position are placed along ———.

8 The energy generation in Sun and Stars is mainly due to ———.

9 The half life of radium is 1600 years. The fraction of the sample that would remain after 6400 years is ———.

10 A neutrino is an elementary particle, having ——— mass and ——— charge.

(10 × 1 = 10 marks)

II. Answer all *seven* questions, each question carries 2 marks :

11 List the factors affecting capacitance of a capacitor.

12 What is superconductivity ?

13 Define temperature coefficient of resistance.

14 What is hysteresis ?

Turn over

15 What is half-life ?

16 What are Higgs boson?

17 What is Big Bang theory ?

(7 × 2 = 14 marks)

III. Answer any *two* questions, each question carries 4 marks :

18 Derive an expression for the force between the plates of a charged capacitor.

19 Define resistivity of a conductor. How does it depend upon temperature ? Why resistivity of a conductor increase with temperature ?

20 What is ferromagnetism ? Explain ferromagnetism on the basis of domain theory.

21 Explain how deflection magnetometer can be used to determine moment of the magnet.

22 Briefly outline the evidence that led to the discovery of the : (a) Positron ; and (b) Meson.

(2 × 4 = 8 marks)

IV. Answer any *three* questions, each question carries 4 marks :

23 An isolated metal sphere whose diameter is 10 cm. has a potential difference of 8000 volts. What is the energy density at the surface of the sphere ?

24 An iron rod of density 7700 kg m^{-3} and specific heat capacity 460.4 J $kg^{-1}K^{-1}$ is subjected to cycles of magnetization at the rate of 60 c/s. If the area of B - H curve for the specimen is 5000 joules, find the rise in temperature per minute of the specimen, assuming that the heat generated is not radiated.

25 Show that the mass of radium with an activity of a curie is almost 1 gm. (Mass number = 226, half-life = 1600 years).

26 A magnetic field of 1.6×10^3 MKS units produces a flux of 2.4×10^{-5} Wb in a bar of iron of cross-section 0.2 cm^2. Find the permeability and susceptibility of the specimen.

27 If a pion decays from rest to give a muon of 4.0 MeV energy. What is the kinetic energy of the accompanying neutrino? What is the mass of the neutrino in this process ?

(3 × 4 = 12 marks)

V. Answer any *two* questions each question carries 10 marks :

28 Derive an expression for the electric field due to a circular line charge at a point on its axis.

29 Explain the theory of potentiometer. How will you use it to ?

(a) Compare the e.m.f. of the two cells.

(b) Find the internal resistance of the cell.

30 Explain the latitude and altitude effect in cosmic rays. How are they accounted for ? What are cosmic ray showers and bursts? How do you account for the origin of showers ?

(2 × 10 = 20 marks)