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Reg. No..............................

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2018

(CUCBCSS–UG)

Complementary Course

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 negatively charged. Then the electric field inside the sphere is ————.

　　2　Small drops of the same size are charged to V volts each. If n such drops coalesce to form a single large drop, then its potential will be ————.

　　3　Two charges of 1C and 5C are placed at some distance in air. The ratio of the forces acting on them is ————.

　　4　A voltmeter has a range of 1 V and resistance 1000 Ω. To extend the range to 10 V, the additional series resistance required is ————.

　　5　The carrier density in metallic conductors is of the order of ————.

　　6　Tesla is the unit for measuring ————.

　　7　Name one ferromagnetic material.

　　8　The spin angular momentum of the an electron is equal to ————.

　　9　Antiparticle of electron is ————.

　　10　Energy equivalent to 1 a.m.u. is ———— MeV.

(10 × 1 = 10 marks)

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

　　11　How is work and energy related in electrostatics ?

　　12　Define Farad.

　　13　What is potentiometer ?

　　14　What is TAN A position in deflection magnetometer ?

　　15　Discuss the properties of nuclear force.

　　16　What is hysteresis ?

　　17　What is Milky Way ?

(7 × 2 = 14 marks)

Turn over

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

18 Apply Gauss's theorem to find intensity of electric field at any point due to sheet of charge.

19 Define electric current and current density. Establish the relation between the current density and the velocity of the charge carriers.

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

21 Give the principle and working of any particle accelerator. Give its merits over other type.

22 Explain why quarks in a hadrons have different colours. What are strange particles ?

(2 × 4 = 8 marks)

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

23 Calculate the force between the plates of a parallel plate capacitor, when the area of the plate is 300 cm.^{2} each, the separation is 0.5 cm. and they are charged to PD 1000 volts.

24 An iron rod of 0.2 m. long 10 mm. in diameter and of relative permeability 1000 is placed inside a long solenoid wound with 300 turns/metre. If a current of 0.5 ampere is passed through the rod, find the magnetic moment of the rod.

25 How long does it take for 60 % of a sample of radon to decay ? Half life of radon = 3.8 days.

26 The volume of the core of the transformer is 1000 cm.^{2} It is fed with A.C. of 50 Hz. If the loss of energy due to hysteresis per hour is 36 Joules, calculate the area of B-H loop.

27 1 MeV positron encounters a 1 MeV electron travelling in opposite direction. What are the wavelengths of the photons produced ? Given, rest mass energy of electron or positron = 0.512 MeV.

(3 × 4 = 12 marks)

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

28 What is line charge density ? Derive an expression for the electric field due to an infinitely long uniformly charged straight wire using Coulomb's law.

29 Define "temperature coefficient of resistance". How is it determined using the Carey-Foster Bridge ?

30 Write an essay on elementary particles.

(2 × 10 = 20 marks)