UNIVERSITY OF THE PUNJAB

Sample Paper of Physics II (Paper-A), 2017

Examination: B.Sc. Part-II (IV Year)

Subject: Physics II **Time Allowed: 3hours**

Paper: Theory (Paper-A) **Max Marks: 75**

Note: Attempt Five (5) questions, selecting not more than Two (2) questions from each section.

SECTION-I

Q1. **(a)** Derive an expression for electric field intensity due to circular disk carrying uniform surface charge density. Deduce point charge form of coulomb's law from above expression. **(8+2)**

(b) What must be the distance between a point charge q_1 = 26.3 μC and a point charge q_2 = - 47.1 μC for the attractive electric force between them to have magnitude of 5.66 N. **(3)**

(c) What do you meant by the statement, "electrostatic forces obey the principle of superposition". **(2)**

Q2. **(a)** Derive an expression for magnetic field at any point '*p*' due to a circular current loop. **(10)**

(b) A solenoid 95.6 cm long has a radius of 1.90 cm, a winding of 1230 turns and carries a current of 3.58 A. Calculate the strength of magnetic field inside the solenoid. **(3)**

(c) Is *B* uniform at all the points within a circular loop of wire carrying current? Explain brifly. **(2)**

Q3. **(a)** State Faraday's law of electromagnetic induction, give its mathematical form. What is the significance of negative sign in above expression? **(7+3)**

(b) A long solenoid has a diameter of 12.6 cm. When a current *i* is passed through its windings, a uniform magnetic field of magnitude *B* = 26.6 mT is produced in its interior. By decreasing *i*, the field is caused to decrease at the rate of 6.51 mT/s. Calculate the magnitude of the induced electric field at 2.20 cm from the axis of the solenoid. **(3)**

(c) Is there any way to setup a magnetic field other than by causing charge to move? **(2)**

Q4. **(a)** Derive the expression for average AC power dissipation in series RLC circuit. **(10)**

(b) In a *RLC* series circuit, *R*=160 Ohms , *C*=15μF, *L*=230 mH, *f*=60 Hz. Find the inductive reactants, the capacitive reactants and impedance of the circuit. **(3)**

(c) Why it is useful to use *rms* notation for alternating currents and voltages. **(2)**

SECTION-II

Q5. **(a)** Consider a particle is trapped between the two perfectly reflecting walls a distance L apart. Determine the expression for the energy of the particle. **(10)**

(b) Consider an electron is confined by electrical forces to an infinite deep potential well whose length is 100 pm, which is roughly one atomic diameter. What is the energy of its lowest allowed state? **(3)**

(c) What is meant by wave function? Describe normalization condition for wave function. **(2)**

Q6. **(a)** State and prove Mosley's law. Describe how Mosley's law helped to develop the periodic table of elements. **(6+4)**

(b) How X-rays are produced? Discuss continuous X-rays spectrum. **(2+3)**

Q7. **(a)** Discuss Rutherford's scattering experiment of alpha particles by thin metal foil. **(8)**

(b) In the reaction

$$H^1 + H^3 \rightarrow H^2 + H^2$$

A proton with *K.E* 5.7 MeV is incident on H^3 at rest, what is the Q value of the reaction. **(4)**

(c) What is nuclear transmutation? Give an example. **(3)**

SECTION-III

Q8. **(a)** Describe the formation of energy bands in solids. How band theory of solids is used to categorize metal, semiconductor and insulator. **(2+6)**

(b) Describe formation of depletion region in a junction diode and how it can be reduced. **(5)**

(c) Draw forward and reversed characteristics of a *PN* junction. **(2)**

Q9. **(a)** Describe input and output characteristics of an *NPN* transistor in common collector configuration. **(8)**

(b) What is meant by load line? How it is used to select the Q-point? **(4)**

(c) Which configuration of transistor give maximum voltage gain, explain. **(3)**

Q10. **(a)** Draw the circuit diagram of a *Monostable* multivibrator and explain its working. **(10)**

(b) Explain the operation of *NOR* and *NOT* logic gates with the help of truth tables. **(5)**

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