UNIVERSITY OF THE PUNJAB

B.A. / B.Sc. Part – II

Supplementary Examination - 2018

Roll No. .....

Subject: Physics-II
PAPER: A

TIME ALLOWED: 3 Hrs.
MAX. MARKS: 75

Note: Attempt any Five Questions, selecting not more than Two questions from each section.

Section-I

Q1. **(a)** Derive the expression for the potential energy of an electric dipole placed inside the uniform electric field. (10)

(b) A molecule of water vapor (H_2O) has an electric dipole moment of magnitude $p = 6.2 \times 10^{-30}$ C.m. (a) What is the maximum torque on a molecule of H_2O in a typical laboratory electric field of magnitude 1.5×10^4 N/C.? (b) The work done in rotating the dipole from $\theta_0 = 180°$ to $\theta = 0°$. (3)

(c) When an electric dipole is placed in a non-uniform electric field. Is there a net force on dipole? Explain. (2)

Q.2 **(a)** Prove that for a parallel plate capacitor, the energy density is proportional to the square of the electric field. (10)

(b) How much energy is stored in 2.0 m^3 of air due to the "fair weather" electric field of strength 150 V/m. (3)

(c) How you conclude that electric potential energy reside in the volume between the plates of the capacitor. (2)

Q.3 **(a)** By applying Biot-Savart law, calculate the magnetic field at any point, due to current passing through straight wire segment of length L. (10)

(b) In the Bohr model of hydrogen atom, the electron circulates around the nucleolus in a path of radius 5.29×10^{-11} m at a frequency v of 6.63×10^{-15} Hz. What value of B is set up at the center of orbit? (3)

(c) Is B uniform for all the points within the circular loop of wire carrying a current? (2)

Q.4 **(a)** Discuss the variation of potential difference across the resistor and inductor, when these connected in series with a battery. (10)

(b) A solenoid has an inductance of 53 mH and a resistance of 0.37 Ω. If it is connected to a battery, how long will it take for the current to reach one-half its final steady-state value? (3)

(c) You want to wind a coil so that it has the resistance but essentially no inductance. How would you do it? (2)

P.T.O.

Section-II

Q.5 **(a)** What is photoelectric effect? Explain three major features of photoelectric effect that cannot be explained on the basis of classical wave theory of light. (1,9)

(b) Find the maximum K.E of photoelectron in eV if the work function of the material is 2.33 eV and frequency of radiation is 3.19×10^{15} Hz. (3)

(c) Explain why a tube used to examine photoelectric emission is evacuated? (2)

Q.6 **(a)** State Bohr's postulates of atomic structure. Derive the quantum expression for the energies of stationary states of hydrogen atom. (2,8)

(b) Describe briefly, the basic three level scheme for Laser operation. (5)

Q.7 **(a)** What is the fission chain reaction? Discuss the three problems together with their solutions in working of nuclear reactor based on fission chain reaction. (1,9)

(b) Consider a ^{236}U nucleus is in its ground state. How much energy is required to remove a neutron from it, leaving a ^{235}U nucleus behind? The needed atomic masses are ^{235}U= 235.043924 u; n = 1.008665 u; ^{236}U= 236.045563 u. (3)

(c) Explain the purpose of moderator in nuclear reactor. Is it possible to design a reactor that does not need moderator? (2)

Section-III

Q.8 **(a)** How energy bands can be used to explain the difference between insulators, semiconductors and conductors. Define conduction band. (7,1)

(b) Discuss the operation of full wave rectifier using two diodes. What are ripples, how these can be removed. (5,2)

Q.9 **(a)** Describe the basic structure and operation of NPN transistor. (3,5)

(b) Explain the input and output characteristics of NPN transistor in common base configuration. (7)

Q.10 **(a)** Explain with diagram, how a common emitter transistor can be used as an Oscillator. (10)

(b) Define NOT gate with its symbol, truth table and Boolean equation. Explain how a common emitter transistor can act as NOT gate. (1,4)