RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [2017-20]

B.A. /B.Sc. FOURTH SEMESTER (January – June) 2019

Mid-Semester Examination, March 2019

Date : 28/03/2019 **PHYSICS (General)**

Time : 1pm – 2pm Paper: IV Full Marks: 25

Group - A (2×5)

Answer **any two** of the following questions:

1. a) Explain the formation of the "depletion region" in an open circuited PN function. [2]

   b) What causes majority carriers to flow at the moment when a P region and an N region are brought together? How long this flow will continue? Explain. [3]

2. a) Draw the circuit diagram of a half-wave rectifier. [1]

   b) Prove that the ripple factor of a half wave rectifier is 1.21. [4]

3. Draw the circuit diagram of a full wave rectifier using

   a) Centre tap

   b) Bridge connection

   Explain the working of each. Why bridge connection is preferred than centre tap? [2+2+1]

4. Draw the circuit diagram of a voltage regulator using a zener diode. Explain its working. [2+3]

Group - B (3×5)

Answer **any three** of the following questions:

5. a) What is packing fraction of atom. [1]

   b) Draw a curve between packing fraction and mass number and discuss the nature of the curve. [2+1]

   c) What is Bragg's law of diffraction? [1]

6. a) Find the Q-value in Mev for the following nuclear reaction: [2]

$$_5B^{10} + {}_1H^2 \rightarrow {}_5B^{11} + {}_1H^1$$

mass of $B^{10} = 10.0165$ a.m.u

$B^{11} = 11.01286$ a.m.u

$H^2 = 2.01472$ a.m.u

$H^1 = 1.0082$ a.m.u

   b) 1gm of radium ejects 3.5×10^{10} $\propto$ particles per second. Calculate the half-life of radium, given atomic mass of radium = 226. [3]

7. How energy released in nuclear fusion process. [5]

8. What is Compton's scattering?

   Derive the relation for compton shift in wave length of the incident photon. [1+4]

9. a) Write down the postulates of Bohr's atomic model. What are the limitations of this model.

   b) In a hydrogen like atom, electrons make transitions from energy level with quantum number 'n' to anther quantum number 'n-1'. If n>>1, show that frequency of radiation will be proportional to $\frac{1}{n^3}$. [3+2]

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