



# RAN-1011

## Third year B.Sc (Sem V) Examination

March / April - 2019

PHYSICS : Paper-X

PHY-5010 (Instruments and Digital Electronics)

### सूचना : / Instructions

नीचे दृशविवेक निशानीवाणी विगतो उत्तरवही पर अवश्य लभवी.  
Fill up strictly the details of signs on your answer book

Name of the Examination:

Third year B.Sc (Sem V)

Name of the Subject :

PHYSICS : Paper-X

Subject Code No.: 1 0 1 1

Seat No.:

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Student's Signature

### Instructions:-

1. Draw neat diagrams wherever necessary.
2. Symbols used in the paper have their usual meaning.
3. Figures to the right indicate full marks of the question.
4. Non programmable scientific calculators may be used.

### Q1 Answer the following questions in brief:

08

- (1) What is meant by magnetic condensing lens?
- (2) Why does the deflection suffered by positive rays is much smaller than cathode rays when subjected to same electric field ?
- (3) What is the function of liquid air trap in camera part of Thomson's apparatus?
- (4) For which isotope the packing fraction is zero?
- (5) Name two digital IC families in which basic logic gates are available.
- (6) A four input AND gate is to be designed using diodes and resistances only. Give minimum number of diodes required.
- (7) According to Boolean algebra ;  $(A + B)(\bar{A} + B) = \underline{\hspace{2cm}}$   
(Fill in the blank)
- (8) What is meant by quads and octets of 1s in K- map? .

**Q2 (a) Attempt any one of the following in detail: 10**

- (1) What is a mass spectrograph? Describe construction and working of Bainbridge mass spectrograph in detail with necessary formulae. Give its advantages.
- (2) What is meant by visible and ultraviolet spectroscopy? Describe in detail (i) Constant deviation spectrograph technique for visible region and (ii) ultraviolet spectroscopic technique.

**(b) Attempt any one of the following: 04**

- (1) A beam of singly ionized atoms of mass 25 amu comes out of the velocity selector with velocity  $3 \times 10^7 \text{ m/s}$  and enters into the chamber D of a Bainbridge mass spectrograph to trace a path of diameter 1.2 m. If the electric field in velocity selector is 600 KV/m then find (i) Magnetic induction in the chamber (ii) The path followed by isotope of mass 26 amu. ( $1 \text{ amu} = 1.67 \times 10^{-27} \text{ kg}$ )
- (2) If mass of a proton is 1.008 amu and mass of a neutron is 1.009 amu then find mass defect, packing fraction and binding energy per nucleon for  ${}^9_4\text{Be}$  (mass of  ${}^9_4\text{Be} = 9.012 \text{ amu}$ ).

**Q3 (a) Attempt any one of the following in detail: 10**

- (1) What is Boolean algebra? Describe symbols used in it and explain Boolean laws in detail. State De-Morgan's laws and its significance.
- (2) What is meant by universal gates? Name the universal gates and explain realization of basic logic gates using them with necessary circuits.

**(b) Attempt any one of the following: 04**

- (1) What is logic of XNOR gate. Describe its use as word comparator with necessary circuit.
- (2) Distinguish between two variable k-map and three variable k-map with suitable example.

**Q4 Answer any Two of the following:**

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- (1) Explain electrostatic and magnetic lenses and its use in electron microscope.
  - (2) Discuss working of Dempster's mass spectrograph and its advantages.
  - (3) Write detailed note on sum of product and product of sum methods for development of logic circuits.
  - (4) Write detailed note on binary adders.
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