

**B. N. BANDODKAR COLLEGE OF SCIENCE, THANE**

**F.Y.B.Sc. PHYSICS** *Additional Exam June 2015*

**Duration: 2:30 Hrs**

**USPH 202**

*ATKT* MARKS: 75

**N.B.:** 1) All questions are **compulsory**.

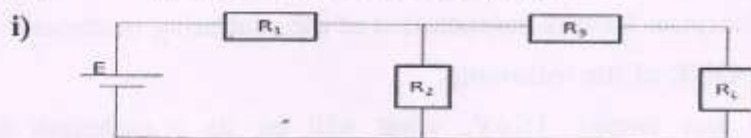
2) Figures on the right indicate **full marks**.

3) **Non – programmable calculators** are allowed.

**Q. 1) (A)** Attempt any **TWO** of the following. **16**

- i) State and prove maximum transfer theorem.
- ii) Explain how to find unknown capacitance using capacitance comparison bridge.
- iii) Find the balancing condition for general AC bridge
- iv) Explain the measurement of charge and current with the help of moving coil galvanometer.

**(B)** Attempt any **ONE** of the following. **4**



Define power. In the above circuit,  $R_1=R_2=R_3=200\Omega$ , what should be the load resistance so that the maximum power is delivered to the load.

- ii) In Wien bridge circuit,  $R_1=R_2=1K\Omega$ ,  $C_1=C_2=0.22\mu F$ , and  $R_4=2.2K\Omega$ . Find the value of  $R_3$  and the frequency of the applied voltage needed to balance the bridge.

**Q. 2) (A)** Attempt any **TWO** of the following. **16**

- i) Find the radii as well as volume of  $O^{16}$  and  $Pb^{208}$  nuclei.
- ii) What is radioactivity? Explain the three kinds of radioactivity with suitable example?
- iii) Write a note on nuclear compositions, Nuclear size and Compton wavelength.
- iv) What is Radiometric dating? Explain how uranium dating helps to investigate age of the Earth?

**(B)** Attempt any **ONE** of the following. **4**

- i) If a sample of radium has half-life time of the order 22 years. Find the time taken by the sample to decrease to 10%?
- ii) Find the B.E and B.E/nucleon of helium nucleus( $\alpha$ -particle)using

following data-

Mass of the helium nucleus = 4.001265a.m.u

Mass of neutron  $m_N = 1.008666a.m.u$

Mass of proton  $m_p = 1.007277a.m.u$

Use  $1 a.m.u = 931.4812 \times 10^6 eV$

**Q.3) (A) Attempt any TWO of the following. 16**

- i) Define the term Group velocity. Show that the de Broglie wave group associated with a moving particle travels with the same velocity as the particle ( $V_g = V$ ).
- ii) Explain the wave nature of matter. Describe Davisson Germer's experiment for the study of electron diffraction.
- iii) Give the experimental arrangement for the study of Compton effect and discuss the results.
- iv) Show that Compton Shift is independent of the scattering material.

**(B) Attempt any ONE of the following. 4**

- i) If a photon has energy 1KeV, what will be its wavelength and frequency?
- ii) Find the  $V_p$  and  $V_g$  velocities of a proton having de Broglie wavelength  $3.96 \times 10^{-14} m$  and mass  $1.67 \times 10^{-27} Kg$

**Q.4) (A) Attempt any ONE of the following. 5**

- i) Define Thevenin's voltage and Thevenin's resistance.
- ii) Define current sensitivity and voltage sensitivity.

**(B) Attempt any ONE of the following. 5**

- i) Explain NMR. State applications of NMR.
- ii) Using law of successive radioactive disintegration, derive equation for daughter nuclei of an element.

$$\left( N_2 = \frac{\lambda_1 N_0}{\lambda_2 - \lambda_1} [e^{-\lambda_1 t} - e^{-\lambda_2 t}] \right)$$

**(C) Attempt any ONE of the following. 5**

- i) State and prove de Broglie's hypothesis
- ii) Explain the phenomenon of the Gravitational Red shift

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