

**B. N. BANDODKAR COLLEGE OF SCIENCE, THANE**  
**F.Y.B.Sc Second Semester March 2012(Additional)**

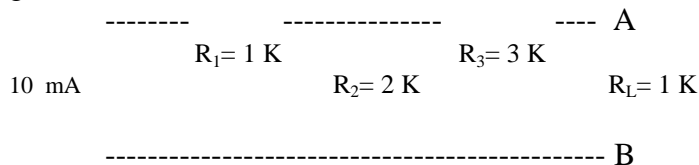
Duration : 2 Hrs

**USPH 202**

MARKS : 60

- 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 **ONE** of the following. (8)  
 1) State and prove maximum power transfer theorem.  
 2) With the help of a neat labeled circuit diagram, obtain the balance condition for the Wien Bridge. Find the expression for the frequency of the ac supply.  
**(B)** Distinguish between the ballistic and dead-beat galvanometer. (4)  
**(C)** Determine the Thevenin's equivalent of the circuit given below. Hence find the load voltage and load current. (3)



- Q.2) (A)** Attempt any **ONE** of the following. (8)  
 1) Explain general properties of a nucleus.  
 2) What is radioactivity? Explain five kinds of induced transmutations of atomic nuclei.  
**(B)** Define atomic mass unit (a.m.u.). Show that 1 a.m.u. = 931 MeV (4)  
**(C)** In a store, 20 mg of a radioactive sample is kept for 4 years. A radioactive sample has half -life time of 2 years. Find how much of the material unchanged? (3)

- Q.3) (A)** Attempt any **ONE** of the following. (8)  
 1) State de Broglie hypothesis. Explain de Broglie concept of matter waves. State the characteristics of matter waves.  
 2) Explain the Compton effect. Show that the Compton shift is

$$\Delta\lambda = \frac{h}{m_0 c} (1 - \cos\theta)$$

- (B)** State Heisenberg uncertainty principles relating conjugate variables: (4)  
 a) position and momentum  
 b) Energy and time  
 or b) angular position and angular momentum  
**(C)** The width of a spectral line of wavelength 4000 A.U. is measured as 10<sup>-4</sup> A.U. Determine the average time that the atomic system spends in this energy state. (3)

- Q.4) (A)** Attempt any **THREE**.  
 1) Explain Lamp and Scale arrangement to determine  $\theta$  in moving coil (4)  
 2) galvanometer.  
 De Sauty's capacitance bridge has R<sub>1</sub> = 800  $\Omega$ , R<sub>2</sub> = 1200  $\Omega$  and C<sub>2</sub> = 0.47  $\mu$ F. (4)  
 3) Find the value of the other capacitor when the bridge is balanced. (4)

- 4) Explain meson theory of nuclear forces. (4)
- 5) Determine the mass of deuterium nucleus; if 1 MeV is the B.E./nucleon. (4)
- (B) Write a short note on : pair production
- At absolute temperature (T), the energy of a particle is of the order of  $kT$ , where  $k$  is the Boltzmann's constant =  $8.6 \times 10^{-5}$  eV/deg. Find the de Broglie wavelength associated with a neutron at  $27^{\circ}\text{C}$ . ( Mass of neutron =  $1.67 \times 10^{-27}$  kg , Planck's constant  $h = 6.60 \times 10^{-34}$  J-sec. (3)