

Vidya Prasarak Mandal's

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A.T.K.T. EXAMINATION, FEB-2011.

Class: **F.Y.B.SC.**

Subject : **PHYSICS II**

Duration : 3 hrs

Total Marks : 90

N.B.

- 1) All questions are compulsory
- 2) Figures to the right indicate full marks.
- 3) Symbols have their usual meanings.
- 4) Use of non-programmable calculator is allowed.

- Q.1. A** Attempt any **ONE**. **08**
- i) Define time constant of an LR series circuit. Derive an expression for growth of current in the circuit.
- ii) Show that the voltage leads the current by $\pi/2$ in an inductance and lags the current by $\pi/2$.
- B** What is a transformer. What are step up & step down transformer. **04**
- C** A capacitor of capacitance $1\mu\text{F}$ discharges through a resistances of $1\text{M}\Omega$ Calculate the time constant of the circuit. **03**
- Q.2. A** Attempt any **ONE**. **08**
- i) State Bohrs first postulate & derive an expression for the energies allowed to the electrons in H- atom.
- ii) What are Braggs plane? Derive Braggs equation for x-ray diffraction by crystals.
- B** What is the shortest wavelength present in the Brackett series of H- spectrum **04**
- C** List three important properties of x-rays **03**
- Q.3 A** Attempt any **ONE**. **08**
- i) What is ripple factor? Obtain its expression for full wave bridge rectifier.
- ii) Draw the output characteristics of CE configuration of transistor. Explain the meaning of a)active region b) saturation region c) cutoff region d) output resistance.

- B** State & prove De-Morgans Theorem **04**
- C** Calculate the emitter current in a CE transistor configuration for which **$\beta=100$ & $I_b=25\mu A$** . **03**
- Q.4. A** Attempt any **ONE**. **08**
- (i) State & explain maximum power transfer theorem.
- (ii) Obtain the condition of balance for De Sauty's capacitance bridge.
- B** Explain the differences between the ballistic and dead beat galvanometer. **04**
- C** In a Wien Bridge ckt, **$R_1=R_2=1k$, $C_1=C_2=0.22\mu F$ and $R_4=2.2k\Omega$** . Find the value of **R_3** and the frequency of applied voltage needed to balance the bridge. **03**
- Q.5. A** Attempt any **ONE**. **08**
- (i) Show that the radius of an atomic nuclear **in $R=R_0 A^{1/3}$**
- (ii) Explain the law of successive disintegration. Derive an expression for the number of atoms in the first two daughter elements formed in the process.
- B** Write a short note on “**Nuclear spin**”. **04**
- C** If a sample of radius has half life time of the order 22 years, Find the time taken by a sample to decrease to 10%. **03**
- Q.6. A** Attempt any **ONE**. **08**
- (i) With the help of neat labeled diagram, explain the set up of Davisson Germer experiment on electron diffraction.
- (ii) Explain the Compton effect, Show that the Compton in **$\Delta\lambda= h(1-\cos\theta)/m_0C$**
- B** What will be the Compton shift **$\Delta\lambda$** of x-ray **0.4 \AA** that show Compton scattering from an electron at **90°** **$m_0=9.1 \times 10^{-31} \text{ kg}$, $C=3 \times 10^8 \text{ m/sec}$** . **04**
- C** An electron is moving along x-axis and the location of an electron is uncertain along x-axis is **$1 \times 10^{-9} \text{ m}$** . Determine the uncertainty in the x-component of its momentum. **$h=6.63 \times 10^{-34} \text{ J.S}$** . **03**