B. N. BANDODKAR COLLEGE OF SCIENCE, THANE

F.Y.B.Sc. - A.T.K.T. AUG.2011

PHYSICS-II **MARKS** : **90**

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

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

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

SECTION: I

Q.1) (A) Answer any **ONE** of the following. **(8)**

(a) A source of constant e.m.f. is connected across a series combination of a capacitor and a resistance. Derive an expression for the charge on the capacitor and current through the circuit during charging.

(b) What is a transformer? What are step-up and step-down transformers? Show that , for an ideal transformer $\frac{V_2}{V_1} = \frac{I_1}{I_2} = \frac{N_2}{N_1}$.

(B) Draw a neat labeled Resonance Curve for series LCR circuit and write the formula for resonant frequency. **(4)**

(C) A 0.1 H inductance is connected across an ac supply of r.m.s. e.m.f. 25 V and frequency 1 kHz. Neglecting the resistance of the inductor, calculate the r.m.s. current flowing through it. **(3)**

Q.2) (A) Answer any **ONE** of the following. **(8)**

(a) State Bohr's first and second postulates of nuclear model of atom and hence obtain an expression for radius of a stationary orbit around the nucleus of charge Ze. Calculate the Bohr radius.

(b) State five important properties of X rays. Explain production of X rays. Write experimental observations.

(B) Explain : i) Emission specta
ii) Absorption spectra **(4)**

(C) An X ray tube emits X rays with minimum wavelength 0.1 $\overset{0}{A}$. What is the operating voltage of the tube? **(3)**

Q.3) (A) Answer any **ONE** of the following. **(8)**

(a) What is a transistor? What are its three configurations of operation? Draw a neat labelled circuit diagram
(i) to study characteristics of NPN transistor in CE mode.
(ii) of Darlington pair of NPN transistors.

(b) Describe NAND gate as a universal building block with logic diagrams and truth tables.

(B) Define current amplification factor α and β . Show that $\beta = \frac{\alpha}{1-\alpha}$. **(4)**

(C) Draw the logic diagram of the following equation,

$$(\overline{A} + B)\ \overline{A}.\ \overline{B}\ .\ \overline{C}\ = \overline{A+B+C}$$ **(3)**

SECTION -II

Q.4) (A) Answer any **ONE** of the following. **(8)**

(a) State and prove Maximum Power Transfer Theorem.

(b) Obtain the balance condition for Wien bridge with a neat circuit diagram. How would you determine the frequency of the ac supply?

(B) A B.G. has current sensitivity of 500 mm/μA . Find the current that produces a deflection of 1 mm. The coil has period 6 second, What is the charge sensitivity? **(4)**

(C) Define the following: **(3)**

(i) Charge sensitivity

(ii)Figure of merit

(iii)Norton Theorem

Q.5) (A) Answer any **ONE** of the following. **(8)**

(a) State and explain the properties of a nucleus.

(b) Explain the following induced transformations of atomic nuclei:

(i) α - decay (ii) β - decay (iii) γ - decay

(B) If a sample of radium has half life time of the order 22 years , find the time taken by sample to decrease to 10 %. **(4)**

(C) What is atomic mass unit? Show that 1 a.m.u. = 931 MeV **(3)**

Q.6) (A) Answer any **ONE** of the following. **(8)**

(a) Explain Compton effect and show that the Compton Shift is

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

(b) With the help of a neat labeled diagram, explain the set up of Davisson-Germer on electron diffraction.

(B) State de-Broglie hypothesis and mention 4 characteristics of Matter Waves. **(4)**

(C) What is the de-Broglie wavelength associated with a proton moving with a velocity equal to $(1/30)^{th}$ the velocity of light. **(3)**

$[m_p = 1.67 \times 10^{-27}$ kg]

~~*~*~*~*~*~*