B. N. BANDODKAR COLLEGE OF SCIENCE, THANE - 400 601.

FIRST TERM EXAMINATION OCT. - 2010

F. Y. B. Sc.

TIME : 2 Hrs.

SUBJECT : PHYSICS - II **MARKS :** 60

N. B. : 1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Non programmable calculators are allowed.

Q.1 a) Attempt ANY THREE : [12]

I) Draw a neat labelled circuit diagram of a full wave bridge rectifier with its input and output waveforms. State the values of its Maximum Efficiency and Ripple Factor.

ii) A 400 mW zener diode with breakdown voltage 5V has negligible resistance. Find maximum current it can carry. What is the current limiting resistor for this zener to carry maximum current if the supply voltage is 15V ?

iii) Describe single crystal Bragg's spectrometer.

iv) Determine the distance of closest approach of 1.00 MeV protons incident on gold nuclei.

v) Show that the root mean square voltage of a sinusoidal voltage, $V = V_0 . \sin wt$ is equal to $\frac{V_0}{\sqrt{2}}$. Also show that its mean value over half a cycle is equal to $\frac{2V_0}{\sqrt{\pi}}$.

b) Draw neat labelled Resonance Curve for series LCR circuit and write a formula for resonant frequency. [3]

Q.2 a) Attempt ANY ONE : [8]

i) What is a transformer ? What are step-up and step-down transformers ? Discuss the theory of a transformer.

ii) A sinusoidal voltage is applied across a series LCR combination. Derive an expression for the impedance of the circuit. Draw the phasor diagrams for voltage in the LCR circuit.

P.T.O.

b) A d.c. source is connected in series with an inductance of 20 mH, a capacitor of 0.05 μf and a resistance of 2KΩ. Will the charging of the capacitor be oscillatory or non-oscillatory ? [4]

c) Define (i) time constant of LR circuit [1]
(ii) Quality factor [1]
(iii) Power factor [1]

Q.3 a) **Attempt ANY ONE :** [8]

i) State and explain mathematically, Bohr's correspondence principle.

ii) How does a typical X-ray spectrum appear ? Explain the continuous X-ray spectrum and find the expression for the minimum wavelength in this spectrum, as given by Daune-Hunt.

b) Find the maximum speed of electrons striking the anode of an X-ray tube operating at 100 K ($m = 9.1 \times 10^{-31}$ kg) [4]

c) What is the shortest wavelength present in the Brackett series of H-spectrum ? ($R = 1.097 \times 10^{7}\ m^{-1}$). [3]

Q.4 a) **Attempt ANY ONE :** [8]

i) State and prove De-Morgan's theorems.

ii) Draw a neat labelled circuit diagram of CE configuration NPN transistor. Define current amplification factor in CE mode and in CB mode. Deduce an expression between α & β.

b) Explain how NAND gate works as a basic building block. [4]

c) Calculate the emitter current in a CE transistor mode for which β = 100 and I_B = 25 μA. Hence calculate α. [3]

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