

VCD - 240315

FYBSC Physics II

Sem II Date - 24/3/18

VCD F.Y.B.SC I SEMESTER 2014-2015 PHYSICS II 75 MARKS 2:30HRS

NOTE: i) All the questions are compulsory

ii) Figures to the right indicates full marks

iii) Use of Non-programmable calculator is allowed

Q1. Attempt the following:

(20)

A) A source of constant emf is connected across a series combination of an inductor and a resistance. Derive an expression for the current in the circuit at time t , after the circuit is switch on. (8)

OR

A) Draw a parallel LCR circuit. Derive an expression for its resonant frequency. Why is it called a rejecter circuit? (8)

B) Show that for a pure resistance in an ac circuit, the current and voltage are always in phase. (7)

OR

B) What is a transformer? What are step-up and step down transformer? Discuss theory of transformer. (7)

C) In a series LCR circuit, $L=400\mu\text{H}$, $R=40\Omega$ and $C=10\mu\text{F}$. Find the resonant frequency for the circuit. (5)

OR

C) A capacitor of $10\mu\text{F}$ and a resistor of $10\text{k}\Omega$ are connected in series with a 6 volt source. Calculate the charge on the capacitor and current in the circuit after 0.1 sec. (5)

Q2. Attempt the following:

(20)

A) Discuss Thomson's atomic model briefly. What were its drawbacks? (8)

OR

A) State Bohrs postulate and derive an expression for the energies allowed to the electron in hydrogen atom. (8)

B) Who discovered X-rays and how? Write some important properties of X-rays. (7)

OR

B) Explain the principle of complementarity of waves and particles. (7)

C) An X-ray tube emits a continuous spectrum of lower limit of wavelength 0.276 \AA . Calculate the operating voltage of the tube. OR (5)

C) The smallest angle of Bragg scattering in KCl is 28.4° for 3 \AA X-rays. Find the distance between the adjacent atomic planes. (5)

Q 3. Attempt the following: (20)

A) Explain half adder and full adder with their logical circuits and truth tables. (8)

OR

A) What is rectifier efficiency? Obtain its expression for full wave bridge rectifier. (8)

B) Explain the operation of transistor as an amplifier. (7)

OR

B) State and prove De Morgan's theorems. OR (7)

C) Prove that $B + \bar{A}\bar{B} + A\bar{C}D + A\bar{C} = A + B$ (5)

c) What are the possible transistor configurations for transistor amplifier? (5)

Q 4. Attempt any three of the following: (15)

A) An ac source specified as $V = 220 \cos 1000t$ is connected across a 500Ω resistance. Calculate the rms and frequency of the source. (5)

B) In a parallel resonant circuit, $L = 50 \text{ mH}$, $R = 40 \Omega$ and $C = 1.0 \mu\text{F}$. Calculate the frequency at which resonance occurs. (5)

C) What is the longest wavelength of Lyman series? (5)

D) Calculate the wavelength of H_α line of paschen series if the wavelength of the H_β line is 486 nm . (5)

E) A 50 kV X-ray tube emits X-rays. If the shortest wavelength of the emitted X-rays is 0.25 \AA , calculate the Planck's constant. (5)

F) In a common base configuration $\alpha = 0.96$. The voltage drop across the load resistance of 2 K connected in the collector circuit is 2.2 V . Find the base current. (neglect leakage current). (5)