

B. N. Bandodkar College of Science, Thane

First Semester Examination, October 2011

USPH102

Duration : 2 hrs.

Total Marks: 60

- 1) All questions are compulsory
- 2) Draw neat and clean diagram wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of non programmable calculator is allowed.

(8)

- Q,1 (A) Attempt any ONE.
- (i) Derive an expression for current in the series LR circuit when switch is closed.
- (ii) A sinusoidal voltage is applied across a series CR combination. Calculate the expression for the current through the circuit. Draw the phaser diagram for voltage in series CR circuit.
- (B) Show that for a pure resistance in an AC circuit, the current and voltage are always in phase. (4)
- (C) A battery of 3v is connected across a series combination of a capacitor of 10 μ F and a resistor of 5k Ω Calculate the time constant and maximum charge on the capacitor. (3)

(8)

- Q,2 (A) Attempt any ONE.
- (i) Derive an expression for the frequencies emitted by H- atom. Explain a spectral series in H- atom spectrum.
- (ii) Describe a single crystal Bragg's spectrometer. The distance between adjacent atomic planes in calcite crystal is 5 \AA . Find the smallest angle of Bragg scattering for 0.5 \AA X rays.
- (B) Explain the term : "Bremsstrahlung" (4)
Deduce Daune Hunt formula for λ_{\min} , minimum wavelength in a continuous X ray spectrum. (3)
- (C) 7.7 MeV alpha particles are incident on a thin gold foil (Z=79). Calculate the distance of closest approach.

P.T.O.

- Q.3 (A)** Attempt any one (8)
- (i) Explain the input and output characteristics of CE configuration of transistor.
 - (ii) What is voltage regulation? Explain how zener diode can be used for voltage regulation.

- (B)** Using a correct transistor configuration obtain the following relation (4)

$$I_c = \frac{\alpha}{1-\alpha} I_B + \frac{1}{1-\alpha} I_{CBO}$$

- (C)** A 400 m W zener diode with breakdown voltage 5v has negligible resistance. Find the maximum current it can carry. What is the current limiting resistor for this zener diode to carry maximum current if the supply voltage is 15v? (3)

- Q.4 (A)** Attempt any **THREE**.

- (i) Show that the charge on a capacitor decays exponentially with time. (4)
- (ii) An AC source specified as $V=220\cos 1000t$ is connected across a 500Ω resistance. Calculate the rms emf and frequency of the source. (4)
- (iii) Find the maximum speed of electrons striking the anode of an X ray tube operating at 400 KV. (4)
- (iv) Using a neat labeled diagram, explain the experimental set up for α - particle scattering experiment. (4)
- (v) Draw a neat circuit diagram of a bridge rectifier. Explain its working with the help of waveform diagrams. (4)

- (B)** In a full wave bridge rectifier without filter each diode has 5Ω forward resistance. The ac input voltage from secondary of transformer is $60\sin 314t$. If the load resistance is 1000Ω . Find the I_{dc} ie. D C current. (3)

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