

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [BATCH 2014-17]

B.A./B.Sc. FOURTH SEMESTER (January – June) 2016

Mid-Semester Examination, March 2016

Date : 21/03/2016

Time : 12 noon – 1 pm

PHYSICS (General)

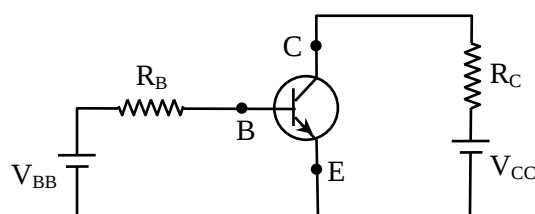
Paper : IV

Full Marks : 25

Answer any five questions :

[5×5]

1. a) Draw the circuit diagram of a full wave bridge rectifier. Explain its working. [2+2]
b) Why bridge rectifier circuits are preferred? [1]
2. a) What is Zener breakdown? [1]
b) Explain clearly the working of the Zener diode as a voltage regulator. [4]
3. Consider the circuit given and determine the Q point.



Given : $V_{CC} = 12V$, $R_C = 1K\Omega$, $V_{BB} = 10.7V$, $R_B = 200K\Omega$, $\beta = 120$ & $V_{BE} = 0.7V$. [5]

4. a) Why Michelson-Morley experiment was performed? What was the outcome of the experiment? [1]
b) State the postulates of Einstein's theory of relativity. [2]
c) Show that the equation of spherical waves : $x^2 + y^2 + z^2 - c^2t^2 = 0$, is invariant under Lorentz transformation. [2]
5. a) What do you mean by time dilation? [1]
b) Derive an expression for time dilation between two inertial frames. [2]
c) If astronauts could travel at $v = 0.95c$, we on Earth would say it takes 4.42 years to reach Alpha Centauri, 4.20 light years away. How much time passes on astronaut's clocks? [2]
6. a) What do you mean by photoelectric effect? [1]
b) What is stopping potential in photoelectric effect? How does it vary with intensity and frequency of incident radiation according to particle nature of light? [2]
c) When light of wavelength $4800\text{\AA}$ is used to irradiate a photocathode, the emitted photoelectrons are found to have a stopping potential of 0.59 volt. With light of $3200\text{\AA}$, the stopping potential is 1.87 volt. Calculate Planck's constant (h), assuming the charge of an electron $e = 1.6 \times 10^{-19}C$. [2]
7. a) What is binding energy of nucleus. [1]
b) Draw a curve, binding energy per nucleon vs mass number and explain stability of nucleus. [1+2]
c) What are radio isotopes? [1]
8. a) Prove $N = N_0 e^{-\lambda t}$, where N_0 is the radioactive element present at time $t = 0$. [2]
b) How energy create in nuclear fusion process. [3]