



MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :

Name :

Fourth Semester B.Sc. Degree Examination, June 2016

First Degree Programme under CBCSS

Complementary Course: Physics – IV (for Mathematics)

AUPY431.2c: Modern Physics and Electronics

Time: 3 Hours

Max. Marks: 80

SECTION – A

*Answer **ALL** questions in a word or one or two sentences.*

1. What do you mean by Bohr radius ?
2. What do you mean by packing fraction ?
3. Define the unit Curie.
4. What is meant by the de Broglie wave length ?
5. Explain the terms Peak inverse voltage and Leakage current for a junction diode.
6. Define base current amplification factor of CE transistor configuration.
7. What do you understand by the input resistance of a transistor in CE configuration ?
8. What do you mean by the band width of an amplifier ?
9. Obtain the 2's complement of the binary number 1010.
10. Draw a logic circuit for the Boolean equation $Y = (A+B) \cdot (C+D)$

(10 × 1 = 10 Marks)

SECTION – B

*Answer any **EIGHT** questions, not exceeding a paragraph.*

11. What are the basic postulates of Bohr atom model ?
12. Explain the concept of spatial quantization.
13. Explain the Pauli exclusion principle.
14. Distinguish between spin angular momentum and resultant angular momentum of atomic nucleus.
15. Explain the terms Half life period and Mean life of a radioactive substance.

P.T.O.

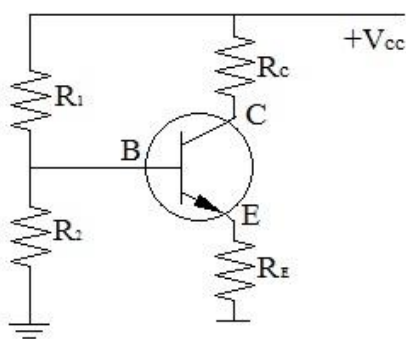
16. Explain Heisenberg's uncertainty principle with examples.
17. Explain any two operators in quantum mechanics.
18. Write down the expression for probability density in quantum mechanics and explain.
19. Explain the breakdown mechanisms of p – n junction.
20. Explain the need for stabilization of operating point in a transistor circuit.
21. Explain the phase reversal of signal in a transistor amplifier.
22. State and explain De Morgan's theorems.

(8 × 2 = 16 Marks)

SECTION – C

Short essay type / Problems : Answer any SIX questions.

23. Show that the velocity of electron in the first Bohr orbit is $(1/137) c$, where c is the velocity of light.
24. Explain the selection rules for the transition of electrons in the vector atom model.
25. Calculate the binding energy of an α particle in Joules.
26. Find the decay constant of radium, whose half life period is 1620 years.
27. The wave function of a particle is $\psi = A \cos^2 x$ for the interval $-\pi/2$ to $+\pi/2$. Find the value of A .
28. Calculate the permitted minimum energy level of an electron in an infinite square well potential box of width 1 \AA .
29. With the help of diagrams, explain the forward bias and reverse bias characteristics of p – n junction diode.
- 30.



In the transistor circuit shown at the left, $R_1=R_2=10 \text{ k } \Omega$, $R_c=1 \text{ k } \Omega$, $R_E = 5 \text{ k } \Omega$ and $V_{cc}=20 \text{ Volt}$. Find the value of emitter current and the collector emitter voltage V_{ce} .

31. Convert the following decimal numbers to binary
 - i) 64
 - ii) 128

(6 × 4 = 24 Marks)

SECTION – D*Long essay type : Answer any TWO questions.*

32. Based on Bohr postulates, derive expressions for the radii of stationary orbits for electrons and the total energy of electron in the orbit.
33. Write short notes for the following
 - i). Radioactive equilibrium.
 - ii). Radioactive decay.
34. i). Explain the important characteristics of wave function.
 ii). Derive the time independent Schrodinger equation.
35. With a neat circuit diagram explain the working of a Bridge rectifier. Derive the expressions for the efficiency and the ripple factor.

(2 × 15 = 30 Marks)

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