

Reg. No. :

Name :

Fourth Semester B.Sc. Degree Examination, August 2022

First Degree Programme under CBCSS

Physics

Complementary Course for Mathematics

PY 1431.1 : MODERN PHYSICS AND ELECTRONICS

(2018 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions in **one** or **two** sentences. Each question carries 1 mark.

1. State Bohr correspondences principle.
2. What do you mean by probability density?
3. Define nuclear magnetron.
4. Define packing fraction.
5. State Paul's exclusion principle.
6. What is the peak inverse voltage of a rectifier?
7. Define operating point?
8. Define knee voltage.

9. What is an octal number?
10. 2's compliment of 0111 is _____

(10 × 1 = 10 Marks)

SECTION – B

Answer **eight** questions, not exceeding a paragraph. Each question carries **2** marks.

11. Explain how quantum numbers are defined in vector atom model.
12. What is the significance of wave functions in quantum mechanics?
13. Write any four characteristics of nuclear force.
14. What percentage of a given mass of a radioactive substance will left after four half-lives?
15. What are the types of radioactive equilibrium? Write down the conditions for them?
16. Draw the circuit diagram and explain the working of a Zener diode voltage regulator voltage.
17. Draw the frequency response curve of a single stage CE amplifier and mention all the regions.
18. Draw the characteristics of a Common base configuration and explain.
19. Derive the relationship between the current amplification factor α and β
20. Draw the AC load line in a transistor circuit.
21. How will you convert a decimal fraction to the equivalent binary number? Give suitable example.
22. Write down the logic symbol and truth table of a NOR Gate.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. Calculate the radii of the first, second and third permitted electron Bohr-orbits in a hydrogen atom.
24. Calculate the permitted energy level of an electron, in a box of 1 Å wide
25. Calculate the binding energy of an alpha particle and express the result both in MeV and Joules. Given mass of proton 1.007276u, mass of neutron 1.008665u, mass of alpha particle is 4.001506u
26. A zener diode has 7.5V across it and a current of 30mA passes through it. Find the power dissipation.
27. An ac supply voltage of 240V is applied to a half-wave rectifier through a step-down transformer of turns ratio 40:1. Find the d.c. output voltage. Neglect the forward resistance of the diode.
28. The radius of ^{165}Ho is 7.731fm. Deduce the radius of ^4He
29. Convert the following numbers in to decimal
(i) 673_8 (ii) $AB9_{16}$
30. A Transistor is connected in CE configuration. The voltage drops across $5K\Omega$ resistance which is connected in the collector circuit is 5 volts. Find the base current. The current gain α of the amplifier is 0.98.
31. Simplify the Boolean expression: $X = \overline{A}\overline{B}C + \overline{A}B\overline{C} + A\overline{B}\overline{C} + ABC$

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. **Each** question carries **15** marks.

32. State and explain the law of radioactive disintegration. Show that number of atoms of a radioactive element decreases exponentially with time.
33. Derive Schrodinger's time independent wave equation. Hence derive the expression for energy of a particle in a box.
34. What is full wave rectifier? Explain the working with necessary theory. Also derive the expression for ripple factor and rectification efficiency.
35. What is a logic gate? Explain the working of different gates with necessary electronic circuit.

(2 × 15 = 30 Marks)