

E 1342

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Reg. No.....

Name.....

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2015

Third Semester

Complementary Course—Physics—QUANTUM MECHANICS, SPECTROSCOPY, NUCLEAR PHYSICS, BASIC ELECTRONICS AND DIGITAL ELECTRONICS

(For Mathematics and Statistics)

[2013 Admission onwards]

Time : Three Hours

Maximum : 60 Marks

Part A (Short Answer Questions)

Answer **all** questions. 1 mark each.

1. What is meant by a black body ?
2. What are the conditions for a well behaved wave function ?
3. Give the merits of Bohr's atom model.
4. What is known as Raman Effect ?
5. Define half life and mean life of a nucleus.
6. Explain artificial radio activity.
7. Give the use of feedback in amplifier.
8. Convert the binary number 101.101 into its decimal equivalent.

(8 × 1 = 8)

Part B (Brief Answer Questions)

Answer any **six** questions. 2 marks each.

9. What are magic numbers ? Explain.
10. Explain the properties of nuclei.
11. What are the major conclusions of Davisson-Germer experiment ?
12. Briefly explain the fine structure of Hydrogen atom.
13. Give the salient features of vector atom model.
14. The Photoelectric effect cannot be explained on the basis of electro magnetic theory. Why ?
15. Explain the amplifying action of a transistor.

Turn over

16. Draw the input and output characteristics of common emitter configuration.
17. Explain the procedure for converting Binary to Hexadecimal and vice versa.
18. State and explain De Morgan's first theorem.

(6 × 2 = 12)

Part C (Problems/Derivations)

Answer any **four** questions. 4 marks each.

19. Find the energy difference between the spin up and spin down states of a proton in a magnetic field of $B = \text{one T}$. What is the Larmor frequency of a proton in this field?
20. An electron is in a box 0.10 nm across. Find its permitted energies.
21. Find the longest wavelength present in the Balmer series of Hydrogen, corresponding to the H_{α} line.
22. A transistor has $\alpha = 0.98$, $I_B = 100 \mu\text{A}$ and $I_{C0} = 6 \text{ Ma}$. Calculate the collector current and emitter current.
23. A 7.2 V Zener is used in a voltage regulator circuit. The load current is to vary from 12 to 100 mA. Find the value of series resistance R to maintain a voltage of 7.2V across the load. The input voltage is constant at 12 V and the minimum Zener current is 10 mA.
24. Draw the full adder circuit and give its truth table.

(4 × 4 = 16)

Part D (Long Answer/Problem questions)

Answer any **two** questions. 12 marks each.

25. State the Planks quantum theory. How it helped to explain the phenomena black body radiation and photoelectric effect.
26. Discuss the rotational spectra of a rigid diatomic molecule.
27. Explain the operation of a centre tapped full wave rectifier with neat diagram. Obtain the expression for ripple factor and efficiency. What are its disadvantages?
28. Discuss in detail, the different types of gates and its truth tables. What are called as Universal gates? Why are they called so? Construct a half adder using XOR gate.

(2 × 12 = 24)