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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, July 2023

First Degree Programme under CBCSS

Physics

Complementary Course for Mathematics

PY 1431.1 : MODERN PHYSICS AND ELECTRONICS

(2018 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. Define Bohr radius.
2. Define Bohr magnetron.
3. Write time independent dependent Schrodinger equation.
4. Define Half life of a radioactive element.
5. What is nuclear binding energy?
6. Draw the V-I Characteristic of a PN junction diodes.
7. Define voltage gain.
8. Draw the block diagram of a NAND gate.

P.T.O.

9. What are hexadecimal numbers?

10. 1's compliment form of 011001 is _____.

(10 × 1 = 10 Marks)

SECTION – B

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

11. State the bostulates of Bohr atom Model.

12. What are the inadequacies of Classical Physics?

13. What is Pauli's exclusion principle? On the basis of this principle explain the configuration of electron in atoms.

14. Explain the salient features of nuclear force.

15. Write a note on secular and transient equilibrium.

16. Draw the output characteristic of a common emitter configuration and explain all the regions.

17. Why the current amplification factor $\alpha$is less than unity?

18. Draw the circuit diagram and explain voltage divider arrangement in transistor.

19. Convert 99.25_{10} in to binary number system.

20. State DE Morgan's theorem and with examples.

21. What is an AND gate? Give its symbol and truth table.

22. Write a short note on octal numbers with examples.

(8 × 2 = 16 Marks)

SECTION – C

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

23. 2gm of a radioactive substance of atomic weight 230 disintegrates at a rate of 3.7×10^{10} disintegration per second. Calculate the decay constant, half life and mean life.

24. Calculate the radius and energy of the electron in the n^{th} orbit in hydrogen from the following data. E = 1.6×10^{-19} coulomb, m = 9.1×10^{-31}Kg, h = 6.61×10^{-34} Js, $\varepsilon_0 = 8.851 \times 10^{-31}$F/M and c = 3×10^8m/s.

25. A particle moving in a one-dimensional box (of infinite height) of width 10 A°. Calculate the probability of finding the particle with an interval of 1 A° at the centre of the box, when it is in its state of least energy.

26. The radius of ^{165}Ho is 7.731 fm. Deduce the radius of ^{4}He.

27. Given the following isotope masses: $^{7}Li_3$ = 7.016004u, $^{6}Li_3$ = 6.015125u and ^{1}no = 1 .008665u. Calculate the binding energy of a neutron in the $^{7}Li_3$ nucleus. Express the results in u, MeV and joules.

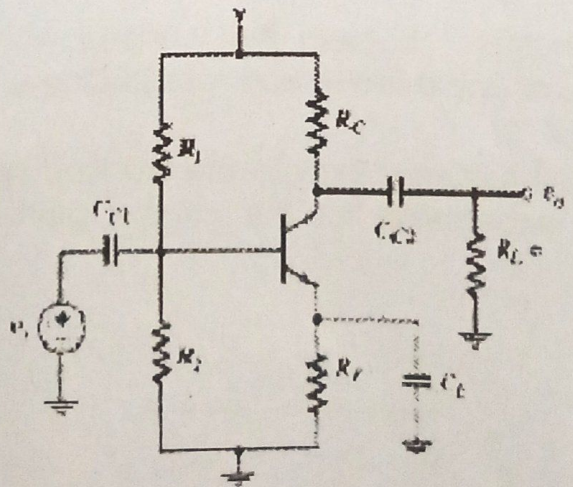
28. A centre-tap full wave rectifier makes use of a 12–0–12V transformer. The forward resistance of each diode = 10Ω. Load resistance = 2000Ω.

    Find

    (a) the d.c. load current and

    (b) the efficiency of the rectifier.

29. Draw the AC load line for the circuit given below. V_{cc} = 15V, R_1 = 30KΩ, R_2 = 10KΩ, R_c = 3 KΩ, R_E = 2KΩ and R_L = 2 KΩ. Draw the AC load line for the circuit given below. (neglect V_{BE}).



30. Convert

(a) hexadecimal number in to decimal

(i) $AC5_{16}$

(ii) $B42_{16}$

(b) Octal number in to decimal

(i) 107_8

(ii) 42_8

31. Simplify the Boolean expression : (A + B) C + ABC.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Describe the vector model of the atom and explain the different quantum numbers associated with it.

33. Derive time dependent Schrodinger equation. Write the equation in three dimensional form

34. What is half wave rectifier? Explain the working with necessary theory. Also derive the expression for ripple factor and rectification efficiency.

35. With the help of a neat diagram explain the working of a single stage transistor amplifier. Obtain the expression for the current gain, voltage gain and power gain.

(2 × 15 = 30 Marks)