(Pages : 4) **J – 3072**

Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, June 2020

First Degree Programme Under CBCSS

Physics

Complementary Course

PY 1431.1 : MODERN PHYSICS AND ELECTRONICS

(For Mathematics Main)

(2018 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. Write down the relation between average life (τ) and decay constant (λ) of a radioactive substance.

2. Write the time dependent Schrondinger equation.

3. Write the truth table of two input NOR gate.

4. The ground state electronic configuration of ^{26}Fe is

5. Two star observed from earth appears to be Red and Blue in color. Which star having the highest temperature?

6. A current gain in common base configuration is 0.90. The emitter current (I_E) is 1 mA. The value of base current (I_B) is

7. The binary equivalent of 9.75_{10} is

8. Draw the logic circuit for the following Boolean expression $AB + \overline{C}$.

9. Write down Planks radiation formula.

10. What is nuclear magneton (μ_n)?

(10 × 1 = 10 Marks)

SECTION – B

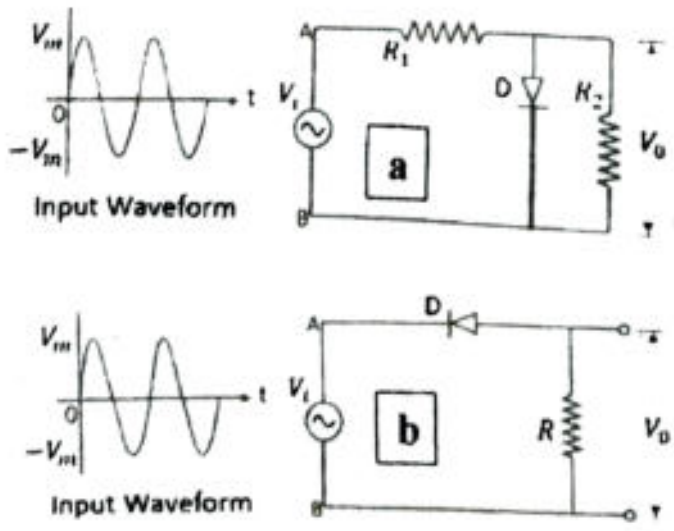
Answer any **eight** questions not exceeding a paragraph. **Each** question carries **2** marks.

11. What is Bohr's correspondence principle?

12. Define Q point of transistor. What is its importance?

13. Explain different breakdown mechanism were observed in an ordinary diode and zenerdiode.

14. Draw the output wave form for the following circuits *a* and *b*, Treat the diode as ideal and input voltage is V_m.



15. Explain following of transistor amplifier (a) band width (b) frequency response curve.

16. State and explain Pauli's exclusion principle.

17. Distinguish between LS coupling j-j coupling.

18. Which of the following wave functions cannot be a solutions of Schrondinger's equation for all values of x ? Why not (a) $\psi = A\tan x$ (b) $\psi = A\sec x$.

19. What are the properties of nuclear forces?

20. State and explain De Morgan's theorem.

21. Using 1's complement subtract 101101 from 111011.

22. Write down the decimal number for the BCD (a) 10011000 (b) 1110000101.

(8 × 2 = 16 Marks)

SECTION – C

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

23. What are the wavelengths of the first three lines of the Paschen series in Rydberg constant is $1.097 \times 10^7\ m^{-1}$.

24. With a neat diagram explain voltage divider bias method.

25. A computer is transmitting the following groups of bytes to an output devices. Give the equivalent octal and hexadecimal listings (a) 10110110 (b) 10010101.

26. A small object of mass 1.00 mg is confined to move between two rigid walls separated by 1.00 cm

    (a) Calculate the minimum energy and minimum speed of the object.

    (b) If the speed of the object is 3 m/s, find corresponding quantum number n.

27. Find the voltage gain of a single stage common emitter amplifier. Given that current gain $\beta = 100$, $R_{in} = 1\,k\Omega$, $R_C = 6\,k\Omega$ and $R_1 = 2\,k\Omega$.

28. A transistor connected in common emitter configuration has a current gain of 50. What is the value of the Collector current and emitter current if base current is 20 μA. Also find the current gain in common base configuration.

29. A particle moving along the x–direction has the wave function $\psi = ax^2$ in the interval $x = 0$ and $x = 1$ and zero elsewhere. Determine the probability that the particle can be found between $x = 0.4$ and $x = 0.6$.

30. Simplify the following Boolean expressions :

    (a) $AB + ABC + \bar{A}B + A\bar{B}C$

    (b) $(AB + C)(AB + D)$.

31. The half life of radium is 1590 years. In how many years will one gram of pure element (a) lose one centigram (b) be reduced to one centigram.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Write a short note on (a) Radioactive decay and Decay laws. (b) Obtain the expression for half life and mean life.

33. Establish time independent Schrodinger's equation from time dependent form of Schrodinger equation. Apply it to find the energy Eigen value of particle in a confined box. Sketch the energy levels.

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

35. Explain construction of Bridge rectifier with neat circuit diagram. Obtain expression for its efficiency and ripple factor?

(2 × 15 = 30 Marks)