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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, March 2020

First Degree Programme under CBCSS

Complementary Course

PY 1431.1/PY 1431.3 MODERN PHYSICS AND ELECTRONICS

(For Mathematics and Statistics)

(2014-2017 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions in **One or Two** sentences. Each question carries **1** mark.

1. What is Bohr correspondence Principle
2. Define half life of a radioactive element
3. What is nuclear binding energy
4. Write time dependent Schrodinger equation.
5. What is Phase reversal of a transistor amplifier
6. Draw the circuit symbol of an OR Gate.
7. Define Q-point.
8. Define the Planck's hypothesis of quantum theory

P.T.O.

9. Draw the frequency response curve of a single stage CE amplifier.

10. State De Morgan's theorems.

(10 × 1 = 10 Marks)

SECTION – B

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

11. 1 gram of a radioactive substance disintegrates at the rate of 3.7×10^{10} disintegration per second. The atomic weight of a substance is 226. Calculate the mean life.

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

13. Explain the salient features of nuclear force.

14. What are the inadequacies in classical mechanics?

15. What is wave function? What is its importance in quantum mechanics?

16. Define Peak inverse voltage. What is the Peak inverse voltage of a half wave rectifier

17. Draw the circuit diagram and explain the functioning of affixed bias circuit.

18. Explain the forward bias characteristics of a pn junction diode.

19. Briefly discuss the characteristics of a zener diode

20. Convert the following numbers in to binary

    (a) 74_{10}

    (b) 136_{10}

21. Write a short note on hexadecimal numbers

22. Draw the block diagram and truth table of an NOR and NAND Gate.

(8 × 2 = 16 Marks)

SECTION – C

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

23. How long does it take for 60 percent of a sample of radon to decay? Half life of radon is 3.8 days.

24. Calculate the probability density for the wave function $\psi(x) = u(x)\exp[i\phi(x)]$, where u, Φ are real.

25. A diode with $_{VF} = 0.7V$ is connected to as a half wave rectifier. The load resistance is 500Ω and the (rms) ac input is 22V. Determine the peak output voltage, the peak load current and the diode peak inverse voltage.

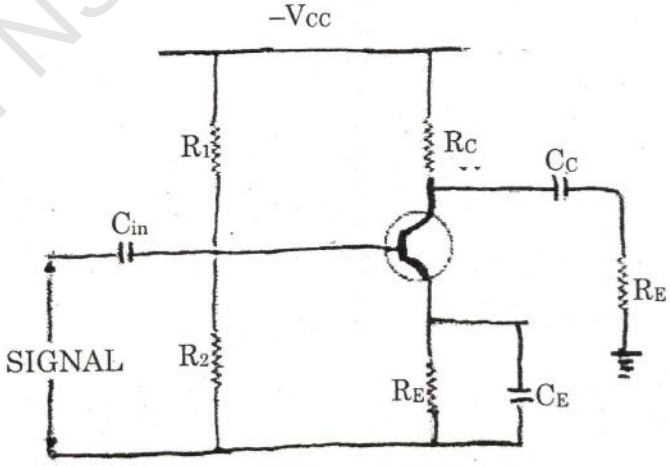
26. A transistor uses potential divider method of biasing. $R_1 = 50K\Omega$, $R_2 = 10K\Omega$ and $R_L = 1K\Omega$. if $V_{CC} = 12$, find

    (a) The value of I_C; given $V_{BE} = 0.1V$

    (b) The value of I_C; given $V_{BE} = 0.3V$. Comment on the result.

27. In a single stage amplifier, the parameters are $\beta = 150$, $r_i = 2K\Omega$, $R_c = 4.7K\Omega$. $R_L = 12K\Omega$. Find the power gain.

28. For a transistor amplifier shown in figure, $V_{CC} = 12V$, $R_1 = 20K\Omega$, $R_2 = 10K\Omega$, $R_C = 1K\Omega$, $R_E = 2K\Omega$ and $R_L = 1K\Omega$. Draw the AC load line for the circuit given below. (neglect V_{BE}).



29. Convert

(a) hexadecimal number into decimal (i) 56_{16} (ii) AF_{16}

(b) Octal number into decimal (i) 56_8 (ii) 137_8

30. Subtract the decimal numbers 38 from 25 in 2' s complement from.

31. Simplify the Boolean expression: $X = \overline{A}\,\overline{B}C + A\overline{B}C + AB\overline{C} + ABC$.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Draw the circuit diagram and explain the working of a single stage CE amplifier also explain the frequency response curve and mention the bandwidth.

33. Derive Schrodinger's time independent wave equation. Hence derive the expression for energy of a particle in a box.

34. State and explain the law of radioactive disintegration, show that the number of atoms of a radioactive element decreases exponentially with time.

35. Draw the circuit diagram and explain the working of a full wave bridge rectifier. Also derive the expression for I_{dc}, I_{rms} ripple factor, efficiency and Peakinverse voltage.

(2 × 15 = 30 Marks)