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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, June 2020

First Degree Programme under CBCSS

Physics

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 questions carries **1** mark.

1. State Pauli's exclusion Principle.

2. Define mean life of a radioactive element

3. What is packing fraction?

4. What do you meant by probability density

5. Write time independent dependent Schrodinger equation.

6. What is Nuclear binding energy.

7. Draw the circuit diagram of CE amplifier

8. Draw the symbol of NAND gate and write down the Boolean expression for it.

9. Define 2's compliment form.

10. Convert 99_{10} in to binary.

(10 × 1 = 10 Marks)

SECTION – B

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

11. Explain how quantum numbers are defined in vector atom model

12. Explain the spin orbit coupling of an electron in an atom

13. Write a note on nuclear detectors.

14. Explain Planck's Quantum hypothesis

15. What are the inadequacies in classical mechanics?

16. Draw the circuit diagram and explain the working of a half wave rectifier

17. Explain the frequency response curve of a single stage CE transistor amplifier and mention the band width

18. What is meant by Q - point? Explain the stability of Q point

19. Draw the circuit diagram and explain the working of zener diode voltage regulator.

20. Draw the Symbol and truth table of NOR gate.

21. State and Explain De Morgan's theorem.

22. Write a short note on octal and hexadecimal numbers.

(8 × 2 = 16 Marks)

SECTION – C

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

23. 1gmof a radioactive substance of atomic weight 226 disintegrates at a rate of 3.7×10^{10} disintegration per second. Calculate the decay constant, half life and mean life.

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

25. A full wave rectifier the load resistance is $1K\Omega$. The forward dynamic resistance of each diode is 10Ω. The voltage across secondary winding is 220 sin 200t. Find the

    (a) Peak value of current.

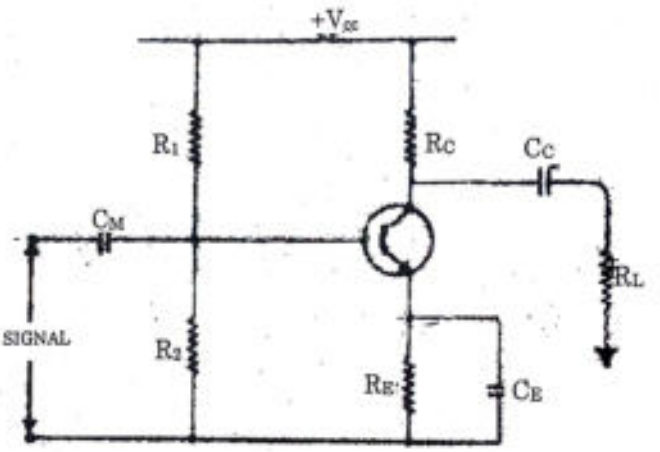
    (b) Average dc value of current.

    (c) the rms value of current.

    (d) The rectification efficiency.

26. A Transistor is connected in CE configuration. The voltage drop 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.

27. For a transistor amplifier shown in figure, $V_{cc} = 15V$, $R_1 = 10K\Omega$, $R_2 = 5k\Omega$, $R_c = 1K\Omega$, $R_E = 2\Omega$ and $R_L = 1K\Omega$. Draw the DC load line and hence find the operating point, Given $V_{BE} = 0.7V$



28. Convert

(a) hexadecimal number in to decimal

(i) AB_{16}

(ii) $7A_{16}$

(b) Octal number in to decimal

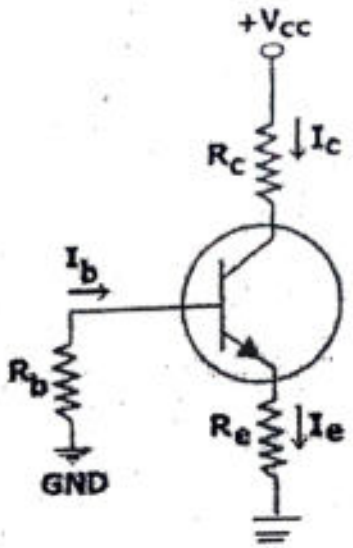
(i) 75_8

(ii) 126_8

29. Subtract the decimal numbers 29 from 21 in 2's complement form.

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

31. Determine the Q point of the transistor circuit shown in figure. Also draw the d.c. load line $R_C = 1K\Omega$, $R_B 47\,K\Omega$, $R_E = 4.7\,K\Omega$, $V_{cc} = 10V$, $\beta = 100$ and $V_{BE} = 0.7V$



(6 × 4 = 24 Marks)

SECTION – D

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

32. State and explain the law of radioactive disintegration. Show that the number of atoms of a radioactive element decreases exponentially with time.

33. Derive time dependent Schrodinger equation. Explain the significance of wave function

34. What is the need for biasing? Draw the Circuit diagram and explain the working of any two biasing circuits.

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

(2 × 15 = 30 Marks)
