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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, July 2018
First Degree Programme under CBCSS
Complementary for Mathematics and Statistics
PY 1431.1/ 1431.3 : MODERN PHYSICS AND ELECTRONICS
(2013 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. What is meant by a wave packet ?
2. What is meant by normalized wave function ?
3. Convert 64H to its equivalent octal and binary form.
4. What are the coupling schemes used in vector atom model to find the total angular momentum of the atom ?
5. What is packing fraction ?
6. Define mean life of a radioactive sample.
7. Draw the V-I characteristics of a PN junction diode.
8. Define knee voltage.
9. Write down the truth table of an AND gate.
10. What are universal gates ? Why are they called so ? **(10×1=10 Marks)**

SECTION – B

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

11. Distinguish between group velocity and wave velocity.
12. Explain Planck's Quantum theory of radiation.
13. Hydrogen has only one electron still it emits a series of spectral lines. How is this possible ?
14. Briefly explain J-J coupling scheme.

P.T.O.

15. What are magic numbers ? Why are they called so ?
16. Explain BCD system. What is its advantage over other systems ?
17. Distinguish between avalanche breakdown and zener breakdown.
18. What are the advantages of voltage divider biasing over other types of transistor biasing ?
19. Distinguish between AC and DC resistance of a diode.
20. Define Q point. What is its importance ?
21. Discuss the logical operation of an OR gate using equivalent electronic circuit. Also obtain its truth table.
22. State and explain De Morgan's theorems. **(8×2=16 Marks)**

SECTION – C

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

23. Write a note on the normalization of wave function.
24. Determine the de Broglie wavelength associated with an electron having kinetic energy 5eV. h = 6.624×10^{-34}Js, mass of the electron = 9.1×10^{-31} kg.
25. The wavelength of Hβ line of hydrogen spectrum is 4862 Å. Calculate the wavelength of Hα line in the same spectrum.
26. Find the binary equivalent of –25 and –10. Also find the sum of these two numbers.
27. Given the mass of a proton is 1.007825u, mass of a neutron is 1.008665 u and mass of a deuteron is 2.01103u. Calculate the binding energy of deuteron.
28. The half life of ^{14}C isotope is 5730 years. If a sample of ^{14}C contains 10^{22} nuclei, what is the activity of the sample ?
29. A 9.1Vzener is connected to load of 500 ohms with a series resistance of 270 ohms to a source of 15V. Calculate
    1) output voltage
    2) load current
    3) zener current

30. In a CE transistor amplifier circuit, $V_{cc} = 12V$, $R_1 = 10k$, $R_2 = 6K$, $R_E = 3.5$ k, $V = 6.4k$, $V_{BE} = 0.7V$. Calculate Ic and Vc.

31. Draw the logic circuits for each of the following expressions.

    a) $AB + C$

    b) $\bar{A}B + (C + \bar{D})$

(6×4=24 Marks)

SECTION – D

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

32. Give an account of the Bohr model of the atom. Explain the origin of spectral lines of hydrogen on the basis of Bohr atom model.

33. Derive the time dependent Schrodinger Equation for a free particle.

34. What is meant by binding energy of a nucleus. Explain the features of the binding energy curve and explain the stability of the nucleus.

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

(2×15=30 Marks)