Reg. No……..…… Name…….. **19U340**

B. Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2019

SEMESTER – 3: PHYSICS (COMPLEMENTARY FOR B.Sc. MATHEMATICS)

COURSE: **15U3CPPHY5: – QUANTUM MECHANICS, SPECTROSCOPY, NUCLEAR PHYSICS, BASIC ELECTRONICS AND DIGITAL ELECTRONICS**

(For Regular - 2018 Admission and Improvement 2017 / Supplementary 2017, 2016, 2015 & 2014 Admissions)

Time: Three Hours Max. Marks: 60

PART - A (Very short answer questions)

(Answer ***all*** questions. Each question carries 1 Mark)

1. State Wein's displacement law.
2. What are matter waves?
3. Write down the spectral terms of H-atom for the n = 2 state.
4. State Pauli's exclusion principle.
5. What are mirror nuclei?
6. Define the radioactive unit Curie.
7. What are magic numbers?
8. What is a negative feedback amplifier.
9. Add $(1011)_2$ and $(1111)_2$.
10. Give the truth table of a NAND gate. (1 x 10 = 10)

PART - B (Short Answer)

(Answer any ***seven*** questions. Each question carries 2 Marks)

11. Compare the Stoke's and the Anti-Stoke's lines in Raman spectrum.
12. State the essential conditions required for a wave function.
13. How Sommerfeld's atom model differs from Bohr model?
14. State the selection rules for L, J and S for an electron transition in vector atom model.
15. Draw binding energy curve and give its main features.
16. Derive an expression for the mean life of a radioactive sample.
17. Define ripple factor. Give its values for half wave and full wave rectifiers.
18. Explain terms Q-point and mid-point biasing.
19. What is an XOR gate? Give its truth table. (2 x 7 = 14)

PART - C (Problem/Derivations)

(Answer any ***four*** questions. Each question carries 4 Marks)

20. Calculate the de Broglie wavelength associated with a ball of mass 46g moving with a velocity of 2500 m/s.
21. The rotational spectrum of BrF shows a series of equidistant lines spaced 0.71433cm^{-1}apart. Calculate the rotational constant and moment of inertia of the molecule. Given h = 6.6 x 10^{-34} Js.

22. The wavelength of Hγ line in H-atom spectrum is 4341 Å. Find the wavelength of the second line of the Paschen series.
23. Calculate the time required for 10% of radioactive Thorium to disintegrate, if its half life period is 1.2×10^{10} years.
24. A 6.2 V zener diode with an output load of 1kΩ is connected to a source of 12V through a series resistance of 100Ω. Calculate the (1) output voltage (2) load current and (3) zener current.
25. A transistor with α =0.98 is connected in the CE configuration. If the collector current is 1.5mA find its base current. (4 x 4 = 16)

PART - D (Essay)

(Answer ***two*** questions. Each question carries 10 Marks)

26. What is photoelectric effect? Explain the laws of photoelectric effect using Einstein's theory.
27. Discuss the properties of atomic nuclei.
28. With the help of a circuit diagram explain the working of a center tapped full wave rectifier. Derive expressions for its efficiency and ripple factor.
29. a) Convert decimal number 45 .75 to binary, octal and hexadecimal equivalents. Also convert $(1011.11)_2$, $(375.0)_8$ and $(1AF)_{16}$ into their decimal equivalents.
    b) What are the basic rules for binary addition, subtraction and multiplication?

(10 x 2 = 20)

****