

Reg. No.....

Name.....

B. Sc. DEGREE END SEMESTER EXAMINATION OCTOBER 2017**SEMESTER – 3 : PHYSICS (COMPLEMENTARY COURSE FOR MATHS)****COURSE: 15U3CPPHY5 – QUANTUM MECHANICS, SPECTROSCOPY, NUCLEAR PHYSICS,
BASIC ELECTRONICS AND DIGITAL ELECTRONICS***For Regular (2016 Admission) & Supplementary / Improvement (2015 & 2014 Admission)*

Time: Three Hours

Max. Marks: 60

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

1. What is Rayleigh-Jeans law? With which wavelength region of Black body spectrum does it agree the short or long?
2. Explain the term Eigen value equation in quantum mechanics.
3. The De-Broglie wavelength of an electron having kinetic energy 1000eV is.....
4. Briefly explain nuclear magnetic moment-its cause and value. Does uncharged neutrons contribute to nuclear magnetic moment?
5. Represent the energy band diagram of p- n junction.
6. Why are stokes lines normally more intense?
7. What do you mean by voltage regulation in a rectifier? Give the expression.
8. The radius of a nucleus of mass number 232 and $R_0 = 1.2 \times 10^{-15} \text{ m}$ is.....
9. Give the relation connecting current gains α and β ?
10. Sketch the truth table of a NOR gate? (1 x 10 = 10)

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

11. State De-Morgans theorems.
12. What do you mean by a free particle in quantum mechanics? Write down the time independent Schrodinger equation for a free particle of mass m.
13. Distinguish between Zener and Avalanche break down.
14. What is photoelectric effect? How does quantum mechanics succeed in explaining the threshold frequency and absence of time lag in this effect.
15. What are the two new concepts introduced in vector atom model? Explain.
16. State the properties of nuclear force.
17. Explain the principle of negative feedback in amplifiers.
18. What do you mean by expectation value in quantum mechanics?
19. Explain the working of a Full adder. (2 x 7 = 14)

PART C (Problem/Derivations)

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

20. Elucidate the J values for a one electron system with $l=3/2$.
21. Determine the uncertainty in the position of an electron weighing 9×10^{-31} Kg moving with an uncertainty in the speed of 3×10^7 m/s.
22. Calculate the de-Broglie wavelength of waves associated with a particle moving with velocity $3/5$ C.
23. Determine the time in which 1 gram of radium will disintegrate to 0.2 gram, if the half life is 1620 years.
24. The first line in the pure rotational spectrum of HCl appears at 21.18 cm^{-1} . Calculate bond length of the molecule. Atomic mass of H is 1.008 amu and Cl is 35.45 amu.
25. Construct a half adder and depict its truth table. (4 x 4 = 16)

PART D (Essay)

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

26. Elucidate the conditions for a well behaved wave function. Starting with time dependent Schrodinger equation, derive the time independent Schrodinger equation.
27. Discuss the nuclear stability on the basis of binding energy/mass number graph. Distinguish between Half life and mean life of a radioactive substance. Explain carbon dating.
28. With a neat diagrams, explain any two types of transistor biasing and describe the working of a common base transistor amplifier. Explain the output and input characteristics.
29. Describe Davisson –Germer experiment and how it established the concept of matter waves. (10 x 2 = 20)
