B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2016
SEMESTER III – COMPLEMENTARY COURSE (PHYSICS)
PH3CM3TB – QUANTUM MECHANICS, SPECTROSCOPY, NUCLEAR PHYSICS, BASIC ELECTRONICS AND DIGITAL ELECTRONICS
(For Mathematics)

Time: Three Hours   **Maximum Marks: 60**

PART A
Short answer questions
I. Answer all questions. Each question carries 1 mark.

1. What is Planck quantum hypothesis
2. Why hydrogen spectra is a line spectra?
3. Mention any two properties of an atomic nucleus.
4. What are universal gates?
5. What is a depletion layer?

(5x1=5)

PART B
Brief answer questions
II. Answer any five questions. Each question carries 2 mark

6. Explain wave packet. Distinguish between phase and group velocity.
7. What is photoelectric effect? Also define threshold frequency.
8. Define Bohr postulates in atom model. What is Bohr radius?
9. What is Raman effect? Define Raman frequency.
10. Explain properties of nuclear force.
11. What is full adder.
12. Compare CE and CB transistor configurations?
13. Draw V-I characteristics of Zener diode.

(5x2=10)

PART C
Descriptive Short essay questions
III. Answer any five questions. Each question carries 5 marks

14. Find the wavelength and frequency of a 100 MeV photon.
15. Find the de Broglie wavelength of a 40g golf ball moving with a velocity of 30 m/s and that of an electron with a velocity of 10^7 m/s.

16. A H atom is 5.3×10^{-11}m. Use uncertainty principle to estimate the minimum energy an electron can have in this atom.
17. Find the longest wavelength present in the Balmer series of H atom spectra.
18. If mass of proton is 1.00785u, mass of neutron is 1.008665u and mass of deuteron is 2.01103u. Find binding energy of deuteron.
19. Convert the decimal number 2579 to hexadecimal system.
20. Convert hexadecimal 9AF and C5E2 to binary number.
21. A transistor is connected in CE configuration to a supply of 9V. The voltage drop across R_c of 1k is 1.5V. If is 0.98, find the collector-emitter voltage V_{CE} and base current.

(5x5=25)

PART D
Long essay type questions
IV. Answer any two questions. Each question carries 10 marks

22. Formulate the time independent Schrodinger equation. Find wave functions of a free particle.
23. Explain the concepts of vector atom model. Also explain various quantum numbers associated with this model.
24. Explain law of radioactive decay. Show that decay is exponential. Derive expression for half-life period and mean life of a radioactive substance.
25. Describe the action of a full wave rectifier? Find an expression for efficiency and ripple factor.

(2x10=20)