JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-3 EXAMINATION- JUNE -2016

B.Tech -II Semester

COURSE CODE: 10B11PH211   MAX. MARKS: 35

COURSE NAME: PHYSICS-II

COURSE CREDITS: 4   MAX. TIME: 2 HRS

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

1. (a) Why specific heat cannot be negative at any temperature. Explain using first law of thermodynamics.

(b) An ideal gas has a molar heat capacity C_V at constant volume. Find molar heat capacity at constant pressure (C_P) as a function of its volume V, if the gas undergoes following process.

(i) $T=T_0 \exp(\alpha V)$ (ii) $P=P_0 \exp(\alpha V)$ [1+2+2]

2. (a) Sketch vector plot of function $\vec{E}(r) = \dfrac{\hat{r}}{r^2}$, (b) A spherical charge distribution of radius a has volume charge density $\rho_v = \rho_0 (a^2 - r^2)$ for $r \le a$; $\rho_v = 0$ for r>a. Calculate total charge and value of r where E becomes maximum. [1+2+2]

3. (a) State Heisenberg uncertainty principle and illustrate it using γ-rays microscope OR diffraction of a beam of electron by a narrow slit. (b) Apply Heisenberg uncertainty principle to explain non existence of electron within the nucleus and zero point energy of Harmonic oscillator.   [2+2+2]

4. (a) Show that the phase velocity of de Broglie wave exceeds the velocity of light,(b) A mono-energetic neutron is at temperature 27 ^{0}C, calculate de Broglie wavelength associated with it. [4]

5. Find the expectation value for a particle in one dimensional box of length a. The wave-function is $\psi = (\dfrac{2}{a})^{1/2} \sin(\dfrac{n\pi x}{a})$ for 0<x<a and ψ=0 elsewhere.   [4]

6. (a) Calculate packing fraction of FCC,BCC and HCP   [1.5+1.5+2]

   (b) Differentiate between unit and primitive cell, name seven group of crystal systems.   [1+2]

7. Describe the method of obtaining miller indices for set of lattice planes. Draw (100), (110) and (111) planes for simple cubic crystal structure.   [3]