Seat No. : _____

N25-103

December-2014

B.Sc., Sem.-III

201 : Physics

Time : 3 Hours] [Max. Marks : 70

Instructions : (1) Attempt **all** questions.
(2) **All** questions carry equal marks.
(3) Symbols have their usual meanings.

1. (a) Explain symmetry operations in detail. 7

OR

Calculate the packing fraction for BCC and FCC structure.

(b) Write Bragg's law for X-ray diffraction. Explain Laue's method to study crystal diffraction. 7

OR

Explain Van der Waal's bond and obtain the expression $u(R) = \frac{4\alpha p_1^2}{R^6}$.

2. (a) Explain leakage current in : 7
(i) CB configuration and obtain the expression for I_C.
(ii) CE configuration and obtain the expression for I_{CEO}.

OR

Show that the maximum efficiency of a Class A amplifier is 25%.

(b) Explain the construction and working of silicon controlled rectifier (SCR). 7

OR

Describe the working of zener diode as a voltage regulator.

3. (a) Explain Frank-Hertz experiment in detail. 7

OR

Obtain the energy equation in case of
(i) a particle in a box and
(ii) simple harmonic oscillator

(b) Obtain the Schrödinger equation for a free particle in one dimension. 7

OR

Explain conservation of probability and show that Schrödinger equation satisfies conservation of probability.

P.T.O.

4. (a) Obtain the expression for resolving power of a plane diffraction grating. 7

OR

(i) How many lines on a grating should be used to resolve the lines of wavelengths 5890 Å and 5896 Å ?

(ii) An objective of telescope has diameter of 3 m. What will be the minimum angle subtended by two stars, so that they can be seen as separate objects ? (λ_{av}(visible) = 5500 Å)

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(b) Explain :

(i) Resolving power of telescope and

(ii) Zone plate

OR

Discuss Fraunhoffer diffraction by double slit and obtain an expression for the intensity.

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5. Answer in brief :

(1) Find the Miller indices of a plane whose intercepts on X, Y, Z axes are (2, 1, 2) respectively.

(2) Find the Miller indices of a plane whose intercepts on X, Y, Z axes are (1, 1, ∞) respectively.

(3) Define a primitive and non-primitive cell.

(4) What is the co-ordination number in HCP structure ?

(5) Write any one use of UJT.

(6) Define Q-point.

(7) What is a Transistor ?

(8) What is Compton's effect ?

(9) Define a rigid rotator.

(10) Define normalized wave function.

(11) Write Bohr's correspondence principle.

(12) The area of Fresnel-half period zones is A_n = _____.

(13) Write Rayleigh's criterion.

(14) There are 12700 lines per inch in a plane grating. Find the angular position for 1st order maxima for the wavelength of 6000 Å.
