



**JB-003-001602**

Seat No. \_\_\_\_\_

**B. Sc. (Sem. VI) (CBCS) Examination**

**August – 2019**

**Physics : Paper - 602**

*(Statistical Mechanics, Solid State Physics & Plasma Physics)*

**Faculty Code : 003**

**Subject Code : 001602**

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

- Instructions :** (1) Symbols and notations have their usual meaning.  
(2) Total marks of the question are indicated on the right side of the question.  
(3) Attempt as many questions as instructed in the main question.

**1 Write short answers to the following questions : (1 mark each) 20**

- (1) In BE statistics the term BE is the abbreviation of what?
- (2) With how many coordinates the phase space is denoted? Which are they?
- (3) By which law we say that the least volume of the phase space is  $h^3$ ..
- (4) Write equation showing Stirling's approximation.
- (5) Electrons are applicable to which branch of statistical distribution laws?
- (6) Write the equation stating Dulong-Petit law.
- (7) Using Powder diffraction method one can examine many Bragg's peaks in one angular run. True or False?
- (8) Write Bragg's equation for diffraction of X-rays by crystals.
- (9) What is wavelength range in which the X-rays can be put to use for crystal structure determination of crystalline solids by diffraction experiment?

- (10) What type of X-rays are used in Powder diffraction. Monochromatic or Polychromatic?
- (11) Who discovered the superconductivity?
- (12) Good conductors such as Copper, Gold and Silver do not become superconductive down to lowest possible temperatures. True or False?
- (13) Which type of magnetism is shown by the material which is in superconducting state?
- (14) What is the total charge of a copper pair in terms of electronic charge?
- (15) What is the unit of conductivity?
- (16) What is the order of conductivity in metals?
- (17) PLASMA is regarded as the fourth state of matter. True or False?
- (18) PLASMA state is essential in Fusion Reactors. True or False?
- (19) Phonons are related to the lattice vibrations. True or False?
- (20) Write the names of the types of Liquid Crystals.

- 2** (A) Write short answers to any **three** of the following : **6**  
(2 marks each)
- (1) Give differences between BE and FD statistics.
  - (2) Define Phase space.
  - (3) What do the terms Distinguishable and Indistinguishable mean in statistical mechanics?
  - (4) Explain the Bragg's equation for X-ray diffraction by a crystal.
  - (5) Write a brief note on Powder X-ray diffraction pattern.
  - (6) Calculate distances between (111) Miller planes for cubic system having  $1 \text{ \AA}$ .

- (B) Write answers to any **three** of the following : **9**  
(3 marks each)
- (1) Prove Stirling's approximation.
  - (2) Write note on degrees of freedom.
  - (3) Write note on Einstein's theory of specific heats of crystalline solids.
  - (4) Define Black Body and explain Wein's displacement law.
  - (5) Write a note on Rotating Crystal diffractometer.
  - (6) Write a note on Miller indices.
- (C) Write answers to any **two** of the following : **10**  
(5 marks each)
- (1) Derive the distribution law for MB statistics.
  - (2) Explain in detail Laue method of X-ray diffraction.
  - (3) Explain Free electron model and Electronic emission.
  - (4) Write note on Debye's theory of specific heat of solids.
  - (5) Write a note on Liquid crystals.
- 3** (A) Write short answers to any **three** of the following : **6**  
(2 marks each)
- (1) What is super-conductivity?
  - (2) Give the names of the external agents affecting superconducting state.
  - (3) What is Photoconductivity?
  - (4) What is critical magnetic field in superconductivity?
  - (5) Give examples of the applications of Liquid Crystals.
  - (6) Give examples of the photoconducting materials.
- (B) Write answers to any **three** of the following : **9**  
(3 marks each)
- (1) Write brief note on the Meissner effect.
  - (2) Write note on ionization of atoms and molecules in context of PLASMA.
  - (3) Derive the equation of London's theory of superconductors.
  - (4) Write a note on the Luminescence.
  - (5) Write the applications of superconductivity.
  - (6) Write about the applications of PLASMA.

(C) Write answers to any **two** of the following : **10**  
(5 marks each)

- (1) Write a detailed note on Thermodynamics of superconductivity.
  - (2) Write a detailed note on the Josephson effect of superconductors.
  - (3) Write a detailed note on Photosensitivity.
  - (4) Write a detailed note on production of PLASMA.
  - (5) Write a detailed note on PLASMA oscillations.
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