



DNN-003-021201

Seat No. _____

M. Phil. (Sem. II) (CBCS) Examination

April / May – 2015

Physics : Paper-II

Advances in Physics [New Course]

Faculty Code : 003

Subject Code : 021201

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

[Total Marks : 70

Instructions

- (1) All questions are compulsory
- (2) All questions carry equal marks

- Q.1 Answer in brief (any seven) (02 marks each) 14
02
- (a) Calculate and show the average Cu-valence in $\text{YBa}_2\text{Cu}_3\text{O}_7$ and $\text{YBa}_2\text{Cu}_3\text{O}_6$ superconductors? 02
 - (b) Why $\text{YBa}_2\text{Cu}_3\text{O}_7$ superconductor is called as defect perovskite? 02
 - (c) Draw crystallographic unit cell of $\text{YBa}_2\text{Cu}_3\text{O}_6$. 02
 - (d) What is NLO effect? 02
 - (e) What are the methods used for the growth of NLO crystals? 02
 - (f) What is hyperfine field and quadruple splitting. 02
 - (g) Draw a typical Mossbauer Spectrum of normal spinel ferrite. 02
 - (h) Define intrinsic and extrinsic MR. 02
 - (i) What is meant by exosphere? 02
 - (j) What do you understand by hydrostatic equilibrium? 02
- Q.2 Answer the following (any two) 14
- (a) Give a detailed account of various steps involved in the synthesis of $\text{YBa}_2\text{Cu}_3\text{O}_7$ superconductor using Solid State Reaction method. Write a note on the advantages and disadvantages of this method. 07
 - (b) Using a well labeled diagram of unit cell of Y-123 superconductor, describe the role of Copper, Oxygen and Yttrium in the superconductivity of YBCO. 07
 - (c) Discuss the concept of hole filling, hole doping and pair breaking in YBCO using suitable examples. 07

- Q.3 Answer the following 14
- (a) Describe the steps involved in the growth of LCMO manganite films using CSD technique. 07
 - (b) Discuss the concept of 'Spin Polarized Tunneling' (SPT) and 'Spin Dependent Scattering' (SDS) in CMR manganites. 07

OR

- Q.3 Answer the following 14
- (a) Explain the effect of particle size on the XRD line width of Ferrite sample with suitable example. 05
 - (b) Discuss the effect of Zn- concentration on the variation in saturation magnetization of Ni-Zn ferrite. Write a brief note on the cation distribution using XRD data analysis. 05
 - (c) Describe in brief the methods for the synthesis of fine particle of ferrites. 04
- Q.4 Answer the following (any two) 14
- (a) Explain the solution growth method of crystal growth. Using this method which crystals can be grown? 07
 - (b) Describe in detail Czochralski method for single crystal growth. What precautions should be taken during the growth of GaAs crystals using this method? 07
 - (c) Discuss the substitutional effects on the properties of HTSC material with suitable examples. 07
- Q.5 Answer the following (any two) 14
- (a) What are the types of NLO materials? Give examples. Write various applications of NLO materials? 07
 - (b) Derive an expression for hydrostatic equilibrium. 07
 - (c) Discuss the method for the determination critical current density in HTSC by magnetic measurements. 07
 - (d) Explain the phenomena of heat balance, heat loss and heat transport. 07