



HDY-003-01203003 Seat No. _____

M. Sc. (Sem. III) (CBCS) Examination

November/December – 2017

Physics : ET - 01

(Synthesis of Materials) (New Course)

Faculty Code : 003

Subject Code : 01203003

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

[Total Marks : 70

- Instructions :**
- (1) All questions carry equal marks.
 - (2) Full marks are indicated at the right end of each question.
 - (3) Symbols have their usual meanings.

1 Answer any seven of the following : **14**

- (a) Which sites are occupied by Al^{3+} ions in Al_2O_3 and $MgAl_2O_4$?
- (b) What is "Conduction Heating" ?
- (c) What are "sol" and "gel" in sol-gel method ?
- (d) What is the principle of co-precipitation technique ?
- (e) What is meant by "Vacuum Evaporation" ?
- (f) What is sputtering ?
- (g) What is monocrystalline material ? Give names of any two methods to grow monocrystalline sample.
- (h) What is the characteristic of XRD pattern for poly-crystal ? Mention it with figure.
- (i) Give the names of four different methods of crystal growth in gel.
- (j) What do you mean by hydrothermal growth ?

- 2 Answer any two of the following :
- (a) What is ceramic method ? Discuss Wagner reaction mechanism of solid state reaction in detail. 7
 - (b) Discuss the experimental procedure of solid state reaction method with reference to "Mixing of Reactants" and "Heat Treatment". 7
 - (c) Discuss the typical procedure for the preparation of $Y_1Ba_2Cu_3O_{7-\delta}$ super conductor through microwave synthesis. 7
- 3 (a) What is the principle of sol-gel method ? Discuss the synthesis of "Doped Tin Dioxide" using sol-gel method. 7
- (b) Explain the advantages and disadvantages of co-precipitation method. 7
- OR**
- 3 (a) Write down the basic principle of Czochralski method. Which types of crucibles, insulators and heating sources are used in this method. 5
- (b) What do you mean by Pull rate and Rotation rate in Czochralski method ? 5
 - (c) Discuss the parameter diameter control and thermal gradient in Czochralski method of crystal growth. 4
- 4 Answer any two of the following :
- (a) Discuss floating zone process to grow single crystal. 7
 - (b) Discuss crystal growth by gel. 7
 - (c) Discuss the Molecular Beam Epitaxy for the growth of single crystal thin layers. 7
- 5 Write any two short notes of the following :
- (a) Vacuum Evaporation Technique. 7
 - (b) Pulsed Laser Deposition (PLD) technique. 7
 - (c) Spin Coating Method. 7
 - (d) Molten salt method to obtain oxide crystals. 7