

Code No: 07A61803

**R07****Set No. 2**

III B.Tech II Semester Examinations, December 2010

**POWDER METALLURGY**

Metallurgy And Material Technology

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Explain the following and give the characteristics of the powders thus produced:
  - i. Production of sponge iron powder
  - ii. Production of copper powder.(b) Explain the following giving their advantages and limitations:
  - i. Production of Tantalum powder by fused salt electrolysis
  - ii. Production of Al flake powders by ball milling. [8+8]
2. Write an essay on the production, properties and applications of a widely used sintered porous metal products. [16]
3. Name the important aluminium alloys used as electrical materials. Give their composition, properties, advantages, disadvantages and applications. [16]
4. (a) Compare and contrast powder metallurgy and metal casting as manufacturing processes.  
(b) Discuss the application of powder metallurgy to the following fields:
  - i. High melting metals
  - ii. Cemented carbides
  - iii. Porous objects
  - iv. Physical mixtures
  - v. Structural parts. [6+10]
5. (a) What are the major functions of powder compaction?  
(b) Classify compaction techniques and list out different process variables of powder compaction. [4+12]
6. (a) List out various important powder characteristics and give their significance in powder processing.  
(b) Discuss different size measurement techniques in detail. [6+10]
7. Critically discuss the sintering phenomenon essentially considered as caused by:
  - (a) a process of mechanical Sintering
  - (b) various flow of metals
  - (c) vacancy diffusion

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(d) surface tension. [16]

8. (a) Write an essay on the uses of cemented carbides.
- (b) Explain about the following intermetallic compound type permanent magnetic materials:
- i. MnBi
  - ii.  $\text{Sm}_2\text{Co}_{17}$
- [8+8]

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FIRSTRANKER

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**R07****Set No. 4**

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1. (a) Distinguish between single end compaction and double end compaction.  
 (b) Explain the effect of compaction pressure and compaction speed on green compact density.  
 (c) Explain the means of eliminating variations in green density distribution. [6+6+4]
2. Critically discuss various theories of sintering. [16]
3. With the help of a flow sheet-1 explain the manufacture of ferrites (P/M method) giving details of the following:  
 (a) Raw materials used  
 (b) Type of milling operation  
 (c) Mixing  
 (d) Sintering stages. [16]
4. (a) List the methods used for producing metal powders. Which methods probably the most important means of producing metal powders?  
 (b) Describe the essential features of the equipment used in the production of powdered metal parts. [8+8]
5. Explain the following basic characteristics of metal powders.  
 (a) Chemical composition and purity  
 (b) Particle size and its distribution  
 (c) Particle porosity  
 (d) Particle microstructure. [16]
6. (a) Distinguish between dispersion strengthened and particles strengthened composites.  
 (b) Discuss about  $Al_2O_3$  dispersion strengthened materials. [6+10]
7. (a) Distinguish between Metal Casting and Powder Metallurgy.  
 (b) What are various methods used for production of metal powders?  
 (c) Describe various uses of metal powders besides consolidation into shapes. [5+6+5]

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8. (a) Explain why soft magnetic materials are preferred over hard magnetic materials in the transformer cores.
- (b) Explain in detail about the slip casting process. For what type of components it is generally used. Explain.
- (c) For what type of applications, Fe-Co-Mo and Pt-Co alloys suited? Explain.
- [6+5+5]

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**R07****Set No. 1**

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**POWDER METALLURGY**

Metallurgy And Material Technology

Time: 3 hours

Max Marks: 80

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1. (a) Define flow rate and explain what is its important? Explain how is it dependent on apparent density of the metal powder?  
(b) Give schematic illustration indicating the effect of particle size, shape and topography on the average velocity of powder flowing through an orifice.  
(c) Describe the effect of surface topography and area on various characteristics of metal powders. [6+6+4]
2. (a) Distinguish between soft ferrites and hard ferrites.  
(b) Explain about the possible advances in future with regard to ferrite technology. [8+8]
3. (a) Distinguish between insulators, semi conductors and conductors with suitable examples.  
(b) What are the materials used for making welding electrodes. Explain their functions in detail. [8+8]
4. (a) What are the uses of copper-lead bearings? Why is overlay bearing gaining increasing importance in recent years? Explain.  
(b) Discuss the mechanism of strengthening in dispersion strengthened composite materials. Explain. [10+6]
5. (a) Write a detailed note on 'behaviour of powder during compaction'.  
(b) Explain about 'green density and mechanical strength' of green compact. [8+8]
6. (a) Discuss the dependence of grain size on particle size for atomized and precipitated powders with regard to the process variables.  
(b) Explain how the particle porosity is achieved and controlled in atomization process to make porous iron powders. [8+8]
7. (a) List out the fields of application of powder metallurgy.  
(b) What are the conditions under which powder metallurgy is preferred over conventional shaping methods?  
(c) What are the specific applications of powder metallurgy prior and subsequent to second world war? [4+6+6]
8. (a) Describe some actual sintering systems. What are the requirements of such systems? Discuss.

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- (b) What evidences are to be provided besides measurement on spheres to indicate that metals generally sinter by volume diffusion mechanism? Explain. [8+8]

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Metallurgy And Material Technology

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
All Questions carry equal marks

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1. What are the various
  - (a) mechanical processes and
  - (b) Physico-chemical processes of powder manufacture. Explain the working principle of any two methods from each group. Discuss their relative advantages. [16]
2. (a) Explain the various reasons to believe that Powder metallurgy is the oldest kind of metallurgical process.
- (b) Name a four powder metallurgy components and explain their advantages and applications. [9+7]
3. What are ceramic magnets? What are their compositions and properties? How are they produced by P/M route? Explain. [16]
4. Explain the following characteristics of metallic powders:
  - (a) Surface Topography
  - (b) Apparent & Tap densities
  - (c) Compressibility & Compactability
  - (d) Pyrophorosity & Toxicity. [16]
5. On what factors does the choice of a furnace atmosphere depend for sintering operation? Describe exothermic and endothermic atmospheres. [16]
6. (a) Discuss the characteristics and uses of sintered aluminium powders.
- (b) What are dispersion strengthened composites? How do they attain high strength. Give the mechanism. [8+8]
7. (a) Does vibratory compaction have greater potential for the production of small or large powder metallurgy parts? Explain.
- (b) Explain how to improve the green strength of a low carbon steel part whose green density is fixed?
- (c) For a given metal how would you expect the difference in the green density distribution in compacts, of identical size and density prepared by using admixed and die wall lubrication? [4+6+6]

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8. (a) Discuss about the following amorphous magnetic materials.
- i. Fe-Co-B
  - ii. Fe-Ni-P-B-Al.
- (b) Discuss the behavior of magnetic materials with respect to their curie points.
- [8+8]

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