

**IV B.Tech. I Semester Regular Examinations, November -2005**

**POWDER METALLURGY**  
**(Metallurgy & Material Technology)**

**Time: 3 hours**

**Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Classify and compare centrifugal atomization methods.  
(b) Discuss the shape of particles obtained by atomization.  
(c) What is the best method for producing alloy powders? Why? [6+4+6]
2. (a) Discuss any two modern Powder Production Methods and compare their advantages and disadvantages.  
(b) What method would you select for the manufacture of bronze powders for porous filters and why? [10+6]
3. Discuss the Hydrometallurgical extraction process for the production of nickel metal powder. [16]
4. (a) What are the steps involved in the conditioning of metal powders.  
(b) Explain the principle and application of slip casting.  
(c) Describe various types of presses used for die compaction. [6+4+6]
5. Discuss the mechanisms of densification during sintering and their relative merits. [16]
6. (a) How can you bring about an improvement in the process of Infiltration?  
(b) Point out the essential requirements in choosing an infiltrant. [8+8]
7. Write an essay on the uses of Cemented carbides. [16]
8. (a) Give a brief outline of the properties of various types of ferrites and their application in various fields.  
(b) Discuss the advantages of permanent ferrite magnets over a metallic permanent magnet. [8+8]

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1. Describe any three of the following powder compaction methods:
  - (a) Isostatic compaction
  - (b) Vibratory compaction
  - (c) Forging of powders
  - (d) Continuous pressureless compaction [16]
2. Give three examples of applications of Powder Metallurgy and briefly explain the reason for such applications. [16]
3. (a) Explain the role of different factors on the degree of compaction of metal powder.  
(b) To what extent can the theoretical density be approached by compacting? [8+8]
4. (a) Describe the sizing and coining operations.  
(b) Discuss the limitations of the component shape imposed by the use of die and punch. [8+8]
5. Deduce the mechanical driving force for neck growth and pore shrinkage during sintering of a compact. [16]
6. (a) What are the prerequisites of a sintering furnace?  
(b) Describe the essential parts of a sintering furnace. [8+8]
7. (a) What are the special advantages of porous bearings.  
(b) Describe their production with reference to choice of material and manufacturing processes. [6+10]
8. Write notes on the following:
  - (a) Sintering atmospheres
  - (b) Dispersion strengthened materials [8+8]

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1. (a) What is Powder Metallurgy?  
(b) When is it preferred over conventional methods?  
(c) What are its advantages and limitations? [4+6+6]
2. Give three examples of applications of Powder Metallurgy and briefly explain the reason for such applications. [16]
3. Compare the different methods of powder production with special emphasis on the reduction and electrolytic processes. [16]
4. Explain the following terms:  
(a) Apparent density  
(b) Tap density  
(c) Green strength  
(d) Flowability [4 x 4]
5. (a) Compare and contrast hot compacting with cold die compaction.  
(b) Explain the process, the limitations and the fields of application of hot compacting.  
(c) Do you expect any variation in the compact strength and other properties in compacts obtained by these two techniques? Give reasons. [6+6+4]
6. (a) How can you bring about an improvement in the process of Infiltration?  
(b) Point out the essential requirements in choosing an infiltrant. [8+8]
7. Describe briefly various types of bearings incorporating metal powders. [16]
8. (a) Critically explain the steps involved in production of welding electrodes.  
(b) What are their fields of application? [10+6]

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1. (a) What do you understand by the process ' Powder Metallurgy' ?  
(b) Trace the History of the development of Powder Metallurgy. [8+8]
2. (a) Critically explain the salient features involved in production of Copper Powders.  
(b) Write an essay on widely used chemical method for the production metal powders. [8+8]
3. (a) What is compaction?  
(b) What changes take place during compaction?  
(c) What are the possible defects and flaws in the compact? [4+6+6]
4. Explain any three of the following powder compaction methods:  
(a) Isostatic compaction  
(b) Extrusion of powders  
(c) Slip casting  
(d) Vibratory compaction. [16]
5. (a) Discuss sintering as the basic process by which interparticle bonding is accomplished.  
(b) Discuss the relative roles of compacting and sintering in pore elimination and compact powder mass densification. [8+8]
6. (a) What kind of Powders are normally put for activated sintering?  
(b) Briefly explain the mechanism behind activated sintering. [6+10]
7. Describe briefly various types of bearings incorporating metal powders. [16]
8. Write short notes on:  
(a) Sintered carbide tools  
(b) Furnaces used for sintering  
(c) Sieve analysis  
(d) Hot isostatic pressing [4 x 4]

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