

Code No: 07A61803

**R07****Set No. 2****III B.Tech II Semester Examinations, APRIL 2011****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. Name the important aluminium alloys used as electrical materials. Give their composition, properties, advantages, disadvantages and applications. [16]
2. (a) Is it possible to produce alloy powders by powder metallurgy? If possible, how? If not possible, why? Give a suitable reasoning.  
(b) Mention the metals, which are commonly made in powder form.  
(c) Distinguish between shotting and atomization. [8+4+4]
3. (a) Discuss the special properties of cemented carbide materials which make it quite distinct from other conventional parts.  
(b) Explain why alnico's are difficult to shape and Cu-Ni-Fe alloys are easy to shape? Also discuss in brief the shaping methods. [8+8]
4. (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]
5. (a) List out various important powder characteristics and give their significance in powder processing.  
(b) Discuss different size measurement techniques in detail. [6+10]
6. (a) Discuss the method of production of bronze bearings. What modifications do you recommend in the manufacture of porous iron bearings.  
(b) What are the advantages and short comings of aluminium bearings. [11+5]
7. (a) Describe some actual sintering systems. What are the requirements of such systems? Discuss.  
(b) What evidences are to be provided besides measurement on spheres to indicate that metals generally sinter by volume diffusion mechanism? Explain. [8+8]
8. (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?

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- (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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**R07****Set No. 4****III B.Tech II Semester Examinations, APRIL 2011****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) What are the advantages in blending or mixing metal powders?  
(b) Explain why lubricants are used? What additional functions are performed by lubricants?  
(c) An effective system of lubrication is necessary both for compaction of powders and ejection of the green compact. Give your explanation to justify this statement. [5+5+6]
2. (a) Define and explain the term sintering.  
(b) Discuss the various stages of sintering. Explain the properties of sintered products. [4+12]
3. (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]
4. (a) Discuss about metal filters.  
(b) Explain about the following:
  - i. Copper-lead bearings
  - ii. Steel backed materials with a porous plastic impregnated lining. [6+10]
5. (a) Discuss the variation of resistivity of a metal with respect to variation of temperature.  
(b) Explain the following:
  - i. Deep penetration coated electrode
  - ii. Non-consumable electrode. [8+8]
6. (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

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- iv. Physical mixtures  
v. Structural parts. [6+10]
7. (a) What are the advantages of atomization and rapid solidification?  
(b) Explain the factors affecting the shape of atomized particles.  
(c) How are premature solidification and coalescence of droplets prevented in atomization? [4+5+7]
8. Explain about the following ferrimagnetic materials.  
(a)  $\text{Fe}_3\text{O}_4$   
(b) Nickel ferrite ( $\text{NiFe}_2\text{O}_3$ )  
(c) Yttrium iron garnet. [16]

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**R07****Set No. 1****III B.Tech II Semester Examinations, APRIL 2011****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 how it is possible to have greater accuracy, smooth surface and good economy in case of powder metallurgy components.  
(b) Why a highly qualified skilled personnel are not required in the powder metallurgy industry. [12+4]
2. (a) Define apparent density and tap density. How these are important for subsequent compaction and sintering? How apparent density be manipulated?  
(b) What factors influence apparent density? Explain all of these.  
(c) What types of powder characteristics are responsible for developing frictional forces during compaction? Explain. [6+6+4]
3. (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]
4. (a) Write a short notes on activated sintering.  
(b) Discuss the Kinetics and mechanisms of furnace atmospheres sintering in detail. [7+9]
5. (a) Describe the manufacture of self lubricating bearings.  
(b) Explain the hydrodynamic lubrication and boundary film lubrication mechanisms that operates in bearing materials operation. [8+8]
6. Explain the following:
  - (a) Production of sponge iron powder based on reduction of an ore
  - (b) Production of Nickel Carbonyl powder by thermal decomposition
  - (c) Precipitation of powder from a liquid
  - (d) Electrolytic deposition of metallic powders. [16]
7. (a) Explain the similarities and dissimilarities between alnico and Sm-co magnetic materials.  
(b) Explain about the following magnetic materials:
  - i. Fe-Co-Mo alloys

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- ii. cu-Ni-Fe alloys. [8+8]
8. (a) Explain the effect of Cu, Ti, & Nb elements added to alnico (a magnetic m/l).  
(b) Write short notes on the following:  
i. Electrical contact materials  
ii. Soft magnetic materials. [8+8]

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1. (a) What is a fusible metal? What are the various types of fusible metals? Give their composition, properties and applications.
- (b) Which are the most widely used electrical resistivity materials. Give their properties and applications. [8+8]
2. (a) How can you bring about an improvement in the process of infiltration in P/M method? Explain in detail.
- (b) Discuss about the two types of bronze bearings, i.e:
  - i. Straight tin bronze and
  - ii. Lead - Bronze bearings. [8+8]
3. Write short notes on the following:
  - (a) Pore effects in sinter metals
  - (b) Stress condition in sinter metals
  - (c) Special sintering techniques. [16]
4. (a) What is the principle of isostatic compaction? Give the advantages and disadvantages of isostatic pressing over other forms of pressing.
- (b) Distinguish between cold and hot isostatic pressing. What are the advantages of hot isostatic pressing over cold isostatic pressing? [8+8]
5. (a) Explain why alnico magnetic materials are produced either by casting method or by P/M method. Discuss in detail. Explain the production of alnico by P/M method.
- (b) What are ceramic magnets? Explain briefly any 2 of them. [12+4]
6. (a) Give comparison of producing metal powders by gaseous reduction of oxides and atomization and give their applications.
- (b) Explain the production of iron powder based on hydrogen reduction of mill-scale and give the characteristics of the powders thus produced. [8+8]
7. (a) Derive an equation for specific surface in terms of sieve analysis data.
- (b) What are median and modal values and explain powder size distributions? [8+8]
8. (a) List out the fields of application of powder metallurgy.

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- (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]

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