

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VI • EXAMINATION – WINTER 2013

Subject Code: 162103**Date: 02-12-2013****Subject Name: Powder Metallurgy****Time: 02:30 pm to 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) What is powder metallurgy? What are the advantages and limitations of powder metallurgy? **07**

(b) Draw a general flow sheet showing various steps of operations for manufacturing a finished powder metallurgical product. Give a brief account of these steps. **07**

Q.2 (a) Give the complete list of methods used for production of metal powders. **07**

(b) Draw a neat sketch to show water atomization process. Give the salient features of water atomization process. **07**

OR

(b) What are the ores of tungsten? How is tungsten powder produced from its ores? **07**

Q.3 (a) Which method/equipment you will use to determine the following characteristics of metal powder?: **07**

- (i) Particle shape (ii) Particle size (iii) Particle size distribution
(iv) Flow rate (v) Apparent density

Explain how these characteristics influence the compaction of metal powders.

(b) Though blending and mixing are two synonymous terms how do they differ in practice? Explain the mechanism of mixing and the working principle of mixing equipment. **07**

OR

Q.3 (a) What tools are used for die compacting? What are their functions? Give an account of different methods of compacting metal and ceramic powder. **07**

(b) What conditioning treatments are given to metal powders and why? Explain clearly the physical changes and variation in density distribution that take place during die compaction of metal powder. **07**

Q.4 (a) What do you mean by Cold isostatic and Hot isostatic pressing? Give a brief description of each with suitable sketch. **07**

(b) Name some unique components which can be manufactured only by powder metallurgy. Describe the manufacture of two such components in detail. **07**

OR

Q.4 (a) Give the classification of various parts made by powder metallurgy. What is the basis of this classification? What are the sources of friction in die compaction of metal powder? How do you overcome frictional forces? **07**

(b) (i) What are the advantages and limitations of isostatic pressing of powders? **04**
(ii) The depth of initial powder fill in a hollow cylindrical die is 40mm. Apparent density of metal powder is 3gm/cc and the compact density at 400Mpa pressure is 6.5 gm/cc. Calculate the height of the green compact. **03**

- Q.5** What do you mean by the term sintering of metal powders? What are different **07**
(a) types of sintering carried out? Give mechanism of liquid phase sintering.
(b) Explain how rolling and forging of metal powder carried out. **07**
- OR**
- Q.5** **(a)** Explain clearly the mechanism of solid state sintering. Why is sintering so **07**
important in powder metallurgy?
(b) Give a brief account of sintering furnace and furnace atmosphere. **07**
