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أسئلة كيمياء المواد
٢٠١٤/٥/٢١

Menofiya University Faculty of Engineering Tim Allowed: 4 hours Second Semester Examination, 2013-2014 Date of Exam: 31/ 5 /2014		4 th year (Production) Processes of forming technology Code: PRE 423 Total mark: 90 marks Production Eng. Dep.
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Answer all the following questions

QUESTION NO. 1

(25 Mark)

- a) Severe plastic deformation (SPD) is a generic term describing a group of metal forming technology involving very large strains. Briefly describe three different techniques of SPD outlining their industrial applications.
- b) Select four major components of the jet engine and explain in details:
i) The suitable materials, ii) The processes by which these components are made.
- c) In IC MIG, the following techniques are used:
-Lithography - Czochralsky -Ion implantation - Ultrasonic welding - CVD
Describe with neat sketch these techniques as related to IC MFG.
- d) Show how bipolar plates in fuel cells are produced.
- e) Suppose you are asked to design and produce wheelchair, identify the important factors involved.

QUESTION NO. 2

(20 Mark)

- a) The manufacturing of aluminum beverage cans is a multistep process that exemplifies several of the metal processing techniques. Describe with neat sketches these techniques.
- b) Super plastic forming (SPF) of sheets is widely used in the aerospace industry to produce complex shapes components. However, while it fosters technology for advanced aerospace concepts and is economical in low-volume applications, SPF has not developed into a large-volume MFG. State (in details) why and how to overcome these drawbacks?
- c) Electrospinning is regarded as a simple and versatile top-down approaches for Nano MFG in a continuous process at a long length scales. Nevertheless, scalable and controllable assembly for 3D fibrous structures still presents a major challenge. Describe with neat sketches the ES process and recent advances in this technique as well as the engineering applications and challenges.

QUESTION NO. 3

(13 Mark)

- a) Outline the differences that can you have observed between
- Hand modeling and hand throwing processes.
- Conventional spinning and shear spinning.
-Uniform and post-uniform elongation.
- Products made of sheet metals and these made by casting and forging
- b) Explain why normal anisotropy is important in determining the deep drawability of a material.
- c) Describe PIM in new ceramics processing. Explain why are the applications of ceramics PIM currently inhibited.

QUESTION NO. 4

(10 Mark)

- a) When a round sheet-metal blank is deep drawn, it is found that it does not exhibit any earing. It is R values in 0° and 90° directions to rolling are 1.4 and 1.8 respectively. What is the R value in the 45° directions?
- b) What are the differences and similarities between?
- Sintering and finishing operations used for parts made of the new ceramics.
- Dry and hot processes in ceramics.
- c) Why is raw materials preparation more important in the processing of new ceramics than for traditional ceramics?

QUESTION NO. 5**(12 Mark)**

- a) Describe with neat sketches the techniques used in forming plastics. Give the type of plastic and product that may be formed in each?
- b) Explain with neat sketch how are plastic tubes, containers and boat hulls made?
- c) What are the advantages and limitations of rotocasting process for plastic forming? and list its important application. Describe the nominal wall thickness of the plastic used?

QUESTION NO. 6**(10 Mark)**

- a) Write short notes about the following?
- High energy rate forming (HERF).
 - Magnetic pulse forming.
 - Explosive forming.
 - SPS
- b) Explain with neat sketch the technique used for forming smaller radar dish and cone shapes?
- c) Functionally graded materials (FGMs) are materials in which some particular physical properties are changed with dimensions. Briefly describe with neat sketches three different techniques for manufacturing the FGM and list the industrial applications of FGMs.

***** GOOD LUCK*****

Question number	Q1	Q2	Q3	Q5	Q2	Q3	Q4	Q6	Q2	Q3	Q4	Q6
Skills	a-1- 1	a-2- 2	a-5- 1	a-1- 1	b-2- 1	b-5- 2	b-5- 2	b-7- 4	c-1- 1	c-2- 2	c-4- 3	c-5- 4
	Knowledge & understanding skills				Intellectual skills				Professional Skills			

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