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Total Number of Pages: 02

**B.Tech**  
**PCMT4404**

**8<sup>th</sup> Semester Regular / Back Examination 2016-17**  
**MATERIALS FOR ADVANCED APPLICATIONS**

**BRANCH(S): METTA, MME**

**Time: 3 Hours**

**Max Marks: 70**

**Q.CODE: Z158**

**Answer Question No.1 which is compulsory and any five from the rest.**  
**The figures in the right hand margin indicate marks.**

- Q1 Answer the following questions: (2 x 10)**
- a) What is cellular material? Give examples.
  - b) What is structure of titanium existing at different temperatures?
  - c) What are superalloys? Give examples.
  - d) What are directional solidification alloys? Give examples.
  - e) Name the bainitic steel and its typical properties.
  - f) What is Inconel alloy? Give its typical composition.
  - g) What are the types of coating methods?
  - h) Define nanomaterial. State its importance.
  - i) What are the typical issues of biomaterials?
  - j) Define biocompatibility. State its importance.
- Q2**
- a) What are nickel based superalloys? (2)
  - b) Explain the effect of major phases present on yield strength of nickel based superalloys. (8)
- Q3**
- a) Write down the properties requirements for materials in the hot regions of gas turbines of aircraft engines. Explain it. (5)
  - b) State different strengthening mechanisms in metallic alloys. (5)
- Q4**
- a) Explain the phase stability and microstructure of  $\alpha$  Ti alloys. (5)
  - b) State high strength to weight ratio and explain its importance in advanced application. (5)
- Q5**
- a) Write down the advantages and disadvantages of dual phase steel used for advanced engineering application. (5)
  - b) Explain the heat treatment and properties of TRIP steel. (5)

- Q6** a) Explain the types of Nanocomposites based on microstructure. (5)  
b) Define biomaterial. Classify the types of biomaterials on basis of their interaction with living tissue. (5)
- Q7** Explain the criteria for the selection of materials for biomedical application. (10)
- Q8** **Write short notes on any TWO:** (5 x 2)  
a) Maraging steel.  
b) HIP replacement.  
c) Cellular material.  
d) Sol-Gel Process.