

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2941

Roll No.

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**B.Tech.**

(SEM. VIII) THEORY EXAMINATION 2011-12

**ADVANCED MATERIALS TECHNOLOGY**

Time : 3 Hours

Total Marks : 100

**Note :—** (1) Attempt **all** questions.

(2) All questions carry equal marks.

1. Attempt any **four** of the following :— **(4×5=20)**

- (a) What is nodular cast iron ? Why are its mechanical properties better than grey cast iron ?
- (b) What are stainless steels ? Classify the different types of stainless steel and write the composition and properties of any one stainless steel.
- (c) Describe the composition, properties and uses of H.S.L.A.S. (High strength low alloy steel).
- (d) Write the typical composition of T-series and M-series high speed steel. Now a days these high speed steels are coated with certain ceramic materials. How do these coatings improve its properties ?
- (e) Discuss how the properties of steel gets affected by

increasing the amount of carbon. What is the effect of increasing the amount of silicon in plain carbon steel ?

(f) Describe a few high temperature resisting steels.

2. Attempt any **four** of the following :— (4×5=20)

(a) What is hardenability of steel ? On what factors does the hardenability of steel depends ?

(b) Describe how normalizing heat treatment of 0.3% carbon steel be carried out and what will its properties be after this normalizing heat treatment ?

(c) Explain how cyaniding of steel components is carried out. What care needs to be taken while carrying out this process ?

(d) Describe the heat treatment that is usually carried out after a component has been carburized.

(e) What are the advantages of induction hardening over flame hardening ? Discuss when these surface hardening treatment are needed to be performed.

(f) Explain what is process annealing. When is this heat treatment usually applied ?

3. Attempt any **four** of the following :— (4×5=20)

(a) Discuss in brief the different stages of precipitation hardening.

(b) Describe the composition properties and uses of different types of brasses.

- (c) Classify the different types of aluminum alloys. How are wrought alloys different from cast alloy ?
- (d) What are dispersion strengthened composite materials ? Why are its mechanical properties better than those of alloys ?
- (e) Name some methods by which refractory materials can be coated on alloys. How do these coating affect their properties and what are the application areas of such coating ?
- (f) What are smart materials ? Discuss the different types of smart materials.

4. Attempt any **two** of the following :— **(2×10=20)**

- (a) What are biomaterials ? Classify the different types of biomaterials used in medicine and dentistry. Describe the different biomaterials that can be used for orthopedic applications.
- (b) Describe the various mechanical properties that are needed in biomaterials used for different applications. How are these properties tested ?
- (c) Describe the various types of steels, polymers, ceramics and composites that are used as biomaterials. Also mention where these biomaterials find their applications.

5. Attempt any **two** of the following :— **(2×10=20)**

- (a) What are nuclear materials ? Classify the different types of nuclear materials. What is the difference between fissile and fertile materials ? Give examples.

- (b) Why are breeder reactors ? What are they used for ?  
What is the use of heavy water in nuclear reactors ?  
Why is it suitable for that application ?
- (c) What material is used for the construction of heat exchanger used in nuclear power plant ? What are the radiation proof materials ? Give examples of such materials and where these materials find their application ?