

- (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 ?

(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.