

B. E. Metallurgical and Material Engineering, 4thYr. First Sem. Examination, 2019

Material Engineering

Time : 3 hrs

Full Marks: 100 Marks

Answer any five questions from the following. (Answer all parts of a question sequentially in a common place)

1. Write technical notes on the following:

- a) Materials used for aerospace applications.
- b) Materials used for High temp applications.
- c) Materials used for biological applications.
- d) Materials used for nuclear applications.

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2. Give brief account of different materials used in the following applications

- a) Line pipe
- b) Electrical springs
- c) Contacts for heavy duty switch gears
- d) Die materials

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3. What are the desirable properties for a bearing material? Discuss about different types of bearing materials.

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4. a) Write about the different types of Magnetic Materials. What is curie temperature ?

b) Write about the use of Perm alloy and Alnico with their compositions.

c) Explain the Pauli's Exclusion principle. Describe the B-H loop for magnetic materials.

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5. Discuss the extent and purpose of addition of the different alloying elements in different grades of alloy tool steels. Write about the heat treatment of Tool steel? Why multiple tempering is needed? 20

6. a) What are the conditions necessary for precipitation hardening to take place in an alloy?

b) Explain the various changes in microstructure that takes place when a Al-4.5 wt% Cu alloy after solution treatment and quenching is aged at about 130 °C. 20

7. a) Define polarization. Show that polarization is numerically equal to bound charge density.

b) Find an expression for the Loss factor for dielectric. 8+12