B.Tech. SEM -IV Mechanical 2014 Course (CBCS) : SUMMER - 2019

SUBJECT : MATERIAL SCIENCE

Day : Tuesday
Date : 28/05/2019

Time : 10.00 AM TO 01.00 PM
Max. Marks : 60

S-2019-2624

N. B. :

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagram **WHEREVER** necessary
4) Assume suitable date if necessary.

Q. 1 **a)** Define the following terms: **(05)**

i) Screw dislocations
ii) Recovery
iii) Atomic packing factor
iv) Single crystal structure
v) Critical resolve shear stress

b) Discuss the mechanism of plastic deformations by grain boundary. Explain the effect of fine grain size and coarse grain size. **(05)**

OR

a) What do you know about re-crystallization? On what factors it depends? Explain the properties changes due to this? **(05)**

b) Find the number of atoms/mm^2 on planes (001) and (011) for the Aluminum elements if the lattice parameter is 3.55 A^0. Draw these planes. **(05)**

Q. 2 **a)** Explain the deep drawing test in details. What are the properties are measured by this test? Where are these properties useful? **(05)**

b) Suggest suitable NDT methods that might be used to identify (Give the reason for your chose) : **(05)**

i) Surface defects with a copper metal.
ii) Internal flaws in steel block.
iii) Shrinkage cavity in Aluminum casting.
iv) Residual stresses in steel wire.

OR

a) Find out the hardness number from following data: **(05)**

i) If the steel block is tested under the 5 mm ball indenter and 120 kg load gives circular impression of diameter 2.03 mm.
ii) Tool steel is tested by diamond indenter with load 80 kg and observe square impression of diagonal length $d_1 = 0.791$ and $d_2 = 0.796$ mm.

b) Explain factors to be considered while selecting the NDT technique for the particular applications. **(05)**

Q. 3 **a)** Explain the methods of plotting an equilibrium diagram by use of cooling curves. **(05)**

b) What is dendrite? Explain the mechanism of formation of dendrites. Can it be Minimized? How? **(05)**

P. T. O.

OR

a) Explain the following in brief: **(05)**

i) Gibb's Phase rule
ii) Uses of Eutectic alloys

b) Construct a phase diagram for the system A and B from the following data: **(05)**
M. P. of element A = 650^0C, M.P. of element B = 800^0C
Eutectic point = 500^0C at 36 % B
Maximum solubility of A in B at 500^0C = 10 %
Maximum solubility of B in A at 500^0C = 20 %
And solubility decreases with temperature to 5 % in each other.
Lable the phase diagram.
Calculate the different phases at 25 % **A** and show the cooling of this alloy from high temperature to room temperature.

Q. 4 **a)** Draw Fe-Fe_3C equilibrium diagram and label the temperature, composition and phases. **(05)**

b) Explain the grey cast iron with its chemical composition micro structural properties, applications and production methods. **(05)**

OR

a) Define the following structural components: **(05)**

Ferrite, austenite, cementite, pearlite, graphite and ledeburite

b) Write a short note on Alloy cast irons. **(05)**

Q. 5 **a)** Write the properties and applications of cartridge brass and Muntz metal. **(05)**

b) What do you know about Precipitation hardening? Explain with suitable examples . **(05)**

OR

a) What is LM series ? Give the chemical composition and properties of LM 6 and LM 14. **(05)**

b) What is zinc equivalent in brass? Calculate it for following alloy 20% Zn ,Sn 2%, Si 1%.. **(05)**

Q. 6 **a)** Explain the details about PVD processes and Ion implantation. **(05)**

b) What is passivity? Explain in detail the theories of passivity. **(05)**

OR

a) Explain the role of design considerations and changes in environmental conditions in corrosion prevention methods. **(05)**

b) Explain in detail about stress corrosion cracking and intergrainular corrosion. **(05)**

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