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[5252]-518

S.E.(Mechanical and Automobile Engineering) (Second Semester)

EXAMINATION, 2017

ENGINEERING METALLURGY

(2015 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :- (i) Answer *four* questions : Q. No. 1 *or* Q. No. 2, Q. No. 3

or Q. No. 4, Q. No. 5 *or* Q. No. 6, Q. No. 7 *or* Q. No. 8.

(ii) Neat diagram should be drawn wherever necessary.

(iii) Use of non-programmable electronic pocket calculator is allowed.

(iv) Figures to the right indicate full marks.

(v) Write answers relevant to the question. Irrelevant statements will not score marks.

1. (a) Define the following terms : [1+1+1+1=4]

1. Phase

2. Alloy

3. Grain

4. Nucleation.

(b) Differentiate between microscopy and macroscopy. [4]

(c) What is the purpose of using etchant ? Explain with diagram.

[2+2=4]

Or

2. (a) Write Hume Rothery's rule of solid solubility. [4]

(b) Explain any *two* methods of grain size measurement. [2+2=4]

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- (c) Differentiate between transmission electron microscope and scanning electron microscope. [4]
3. (a) What are the different types of cast iron ? Explain gray cast iron microstructure. State and justify the use of grey cast iron in two applications. [2+2+2=6]
- (b) Draw neat diagram of microstructures and indicate phases present and their amounts into the following plain carbon steels under equilibrium conditions : [2+2=4]
- (i) 0.2 % carbon steel,
- (ii) 0.8 % carbon steel.
- (c) Give brief explanation of austenite to pearlite transformation ? [3]
- Or
4. (a) On an Iron-Iron carbide phase diagram, indicate the temperature range of the following heat treatment and mention relative cooling rates : [6]
- (i) Full Annealing
- (ii) Normalising
- (iii) Hardening
- (iv) Process annealing
- (v) Nitriding
- (vi) Carburising.
- (b) Differentiate between Martempering and Austempering. [4]
- (c) Explain with the help of figure, Widmanstatten structure. [3]

5. (a) Explain classification of steels on the basis of composition. [4]
(b) What do you understand by weld decay of austenitic stainless steel ? State the methods of prevention of weld decay. [2+2=4]
(c) Prepare a table comparing alloy steels and plain carbon steels on the basis of the following : [4]
(i) Corrosion resistance
(ii) Hardenability
(iii) Cost
(iv) Toughness.

Or

6. (a) What will be the AISI equivalent of the following: [2+2=4]
(i) C40
(ii) T80.
(b) Explain with a neat sketch heat treatment cycle of high speed steel with proper reasoning. [4]
(c) Invar is an alloy containing 64% Iron and 36% Nickel. What is its most notable property ? State and justify two applications for which this notable property is most suitable. [2+2=4]
7. (a) What is age hardening ? Which alloys can be age hardened ? [3+3=6]
(b) Give classification of copper alloys. Differentiate between brass and bronze. [2+2=4]
(c) Write a short note on bearing materials. [3]

Or

8. (a) State true or false and justify : [2+2+2=6]
- (1) Aluminium alloys are widely used in aeronautic and automotive applications.
 - (2) Tin Bronzes show pronounced coring.
 - (3) 60/40 brass can be easily cold worked.
- (b) Name the base metal for the following alloys : [4]
- (i) Duralumin
 - (ii) Gun metal
 - (iii) Beryllium bronze
 - (iv) Monel.
- (c) In a photo micrograph of a polycrystalline cartridge brass specimen, regions having relatively straight and parallel sides and, a shade contrast than the surrounding are observed. What can be these regions ?
Can this feature be used to differentiate between 'as cast' and 'cold worked + annealed' conditions of the alloy ? Explain in two sentences. [1+2=3]