Seat No.	

[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]

(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, Widmansttaten 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 ? Stats 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]

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*) Berylium 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]