

INSTRUCTIONS TO CANDIDATES

(1) All questions carry marks as indicated.

(2) Solve **SIX** questions as follows :

Que. No.- 1 OR Que. No.- 2

Que. No.- 3 OR Que. No.- 4

Que. No.- 5 OR Que. No.- 6

Que. No.- 7 OR Que. No.- 8

Que. No.- 9 OR Que. No.- 10

Que. No.- 11 OR Que. No.- 12

(3) Due credit will be given to neatness and adequate dimensions.

(4) Illustrate your answers with necessary figures/ drawings wherever necessary.

(5) Assume suitable data wherever necessary.

1. (a) Discuss the characteristics, properties and applications of :

(i) Metals

(ii) Polymers

(iii) Composites

(iv) Ceramics.

8

(c) Write short notes on “Nodular cast iron”. 4

OR

10. (a) Draw Cu-50 % Zn equilibrium diagram and explain the effect of increasing Zn content on mechanical properties of Brass. 6

(b) Describe any ‘TWO’ of the following : 2×4=8

(1) Muntz metal

(2) Cartridge Brass

(3) Al-Si Alloy

(4) (α - δ) Bronze.

11. (a) Explain the procedure for measurement of hardness with the help of Rockwell hardness tester. What are its advantages over other hardness test ? 7

(b) What is NDT ? Explain Ultrasonic method of flaw detection. 6

OR

12. (a) Explain the steps involved in the production of components by powder metallurgy technique. 4

(b) Explain the production of cemented carbide tool by powder metallurgy technique. 5

(c) What are the advantages and limitations of powder metallurgy technique ? 4

- (b) Explain the important mechanical properties of metals. 5

OR

2. (a) What is meant by imperfections in crystal ? Explain the various line defects. 5
(b) Calculate packing efficiency of FCC crystal structure. 4
(c) Differentiate between slip and twinning. 4
3. (a) Distinguish clearly between homogenous nucleation and heterogeneous nucleation. 4
(b) Describe the solidification of liquid metal in an ingot mould. 4
(c) What are the various phases obtained in an Alloy ? Explain the types of intermediate phases formed in an alloy. 5

OR

4. (a) Draw a neat Iron-Iron carbide equilibrium diagram. Show all the temperature, composition and various phases present in it. 7
(b) Write and explain three invariant reactions occurring in Fe-Fe₃C diagram. 6
5. (a) Define Hardenability. Explain Jominy End Quench test to find out Hardenability. 7
(b) Differentiate between Annealing and Normalizing of steel. 6

OR

6. (a) Indicate the temperature range of following heat treatments on Fe-Fe₃C diagram :
(1) Full Annealing

- (2) Normalizing
(3) Hardening
(4) Spheroidising
(5) Stress relieving annealing. 5

- (b) Explain the procedure to construct the TTT diagram. Discuss the process of :
(1) Austempering
(2) Martempering by using it. 8

7. (a) Differentiate between Ferrite stabilizers and Austenite stabilizers. 5
(b) Explain the general effect of alloying elements on properties of steel. 5
(c) Write short notes on Maraging steel and its application. 4

OR

8. (a) What do you understand by Red hardness ? How is it achieved in H.S.S ? 5
(b) Why austenitic stainless steel is most popular ? Explain the process of 'Sensitization' and the methods to get rid of it. 5
(c) Write short notes on Hadfield Mn-steel and its application. 4
9. (a) Explain, how white cast iron is converted into malleable cast iron. State its applications. 5
(b) Write the production process, composition, microstructure and applications of grey cast iron. 5

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Examination**

ENGINEERING METALLURGY

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