Total No. of Questions—**8**] [Total No. of Printed Pages—**2**

Seat No.	

[5559]-113

S.E. (Mechanical/Auto.) (First Semester) EXAMINATION, 2019
MATERIAL SCIENCE
(2015 PATTERN)

Time : 2 Hours **Maximum Marks : 50**

N.B. :— (*i*) Answer *four* question : 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 diagrams should must be drawn wherever necessary.

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

(*iv*) Figures to the right indicate full marks.

Q.1 a) Classify and describe different types of polymers on the basis of molecular structure and comment on their mechanical properties [5]

b) Compare metals, ceramics and polymers on the basis of atomic bonding, atomic arrangement and properties. [5]

c) Explain in brief with neat sketch line defects in crystal structures. [3]

OR

Q.2 a) What is work hardening? Explain single crystal and dislocation theory of work hardening. [5]

b) Derive an expression for resolved shear stress across slip plane in a single crystal subjected to tensile load(P). Slip plane is oriented at an angle of "Ø" between normal to slip plane and direction of loading and angle of "λ" between direction of loading and slip plane in the slip direction. State Schmids law. [5]

c) Calculate planar atomic density of (100) plane in FCC, assume lattice parameter as 'a'. Also calculate linear atomic density of [011] direction in this plane. [3]

Q.3 a) State working principle and operational steps of dye penetrant test for detection of surface cracks. [4]

b) Differentiate between true stress-strain and engineering stress-strain. [4]

c) Explain the mechanism of dry corrosion and factors affecting dry corrosion. [4]

OR

Q.4 a) State various methods of prevention of corrosion and explain any one in detail. [4]

b) State true or false and justify your answer. (Full marks for correct justification only) [4]

i) Pitting is the most dangerous form of corrosion.

ii) In anodic protection method for corrosion metal to be protected is forced to behave as cathode.

c) What is fatigue? Draw S-N diagram for ferrous and nonferrous materials. Define the term fatigue limit and fatigue strength. [4]

P.T.O.

Q.5 a) Explain the principle and working of electroplating with neat diagram. Which factors affect the quality of coating in electroplating? [5]

b) Why surface preparation is essential before coating? List various methods of surface preparation and explain any one in detail. [5]

c) Explain in brief different defects observed in coatings. [3]

OR

Q.6 a) How surface modification methods are classified? List at least any two methods in each category and explain any one in brief. [5]

b) Explain with neat diagram PVD process of coating and state its advantages, limitations and applications. [5]

c) Explain in brief with neat diagram Ion implantation. [3]

Q.7 a) Explain the need and mechanism of sintering in powder metallurgy component. What is liquid phase sintering? [4]

b) State various mechanical methods of powder manufacturing and explain in brief atomization. [4]

c) Explain with neat flow chart manufacturing of self-lubricated bearings. [4]

OR

Q.8 a) What do you understand by powder characterization? Explain in brief any two methods of particle size measurement. [4]

b) Explain with neat flow chart manufacturing of cemented carbide tools. [4]

c) State the advantages, limitations and applications of powder metallurgy. [4]